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THE UNIVERSITY OF ALBERTA

AN ECONOMIC FORECASTING MODEL

by

MCINTYRE B. E.

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH

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IN

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EDMONTON, ALBERTA

FALL 1988

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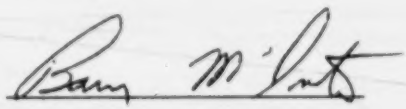
(SIGNED) 

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled **AN ECONOMIC FORECASTING MODEL** submitted by **MCINTYRE B. E.** in partial fulfilment of the requirements for the degree of **MASTER OF SCIENCE** in **MECHANICAL ENGINEERING (ENGINEERING MANAGEMENT)**.

Supervisors

Date Oct 13, 1988

ABSTRACT

Suitable models have not been developed to enable the non-specialist to forecast future economic events. The business person needs to know when to expect changes of trend in the economy to be effective in planning and operating a business firm.

Modelling the economy in the same terms as those used by business firms shows the economy from the producer's view. The forecasts generated thus aid in production and investment decisions. The analysis of economic data using the terms and procedures common to the business person provide for an easier understanding of the causes of economic events, and possible changes of direction.

Basic statistical methods applied to this modelling produce poor results, but graphical analysis provides reliable predictions of important trend changes when used in conjunction with qualitative information. Monitoring of important events and charting the key indicators developed in the model provide a trend change prediction several quarters in advance of the actual change. The method used is reliable and may be undertaken with a relatively small investment of time and money.

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1. INTRODUCTION

1.1 Purpose

The purpose of this work is to provide a method and model which may be used to provide non-specialists with forecasts of economy wide business conditions. This is to be accomplished by estimating macro-economic trends using commonly available information. Part of the application of this technique is to also provide the procedure to relate the macro-economic forecast to a specific industry or region.

1.2 Problem Statement

A problem faced by both large and small firms alike is that of forecast accuracy and applicability. A model, or service which uses a reliable model, is needed which will provide the business manager with reasonable forecasts of future economic activity. Any model or service must be timely, affordable,understandable and usable by non-specialists within the business environment. Production (output) and future investment opportunities are the variables which need to be determined.

Management is responsible for forecasting and decision making, as well as general operations. Forecasts are required to assist the decision process for both current operations and long term planning. Short term decisions such as inventory levels, purchasing, scheduling and staffing require some prediction of the short to intermediate term economic climate. Most firms are price takers[58], and thus needs accurate prediction for operating decisions. An example is a business which manufactures and sells or leases material handling equipment for dry bulk

materials such as fertilizer, grains and drilling mud. These products are usually manufactured and repaired on a steady schedule, while sales and leases are cyclical or seasonal. Inventory and production decisions are often made six to eight months in advance. This requires a large investment in working capital. Inventory, marketing and pricing strategies to successfully move the product must be in place before the quantities are finalized.

At this time, management has few options for predicting economic trends. Models and applications specifically designed for the independent operator do not appear in the literature[78]. Examples of forecasting techniques which are appropriate for larger firms, but which may have application to firms with fewer resources may be found[38]. The methods discussed range from qualitative and empirical to mathematical techniques, using time series and regression analysis. The actual model which produces the forecast must be developed by each firm. This requirement, even with the advent of the micro-computer, tends to put many sophisticated forecasting tools beyond the scope of most small firms.

Most forecasts or predictions used in small firm decision making come from sources outside the firm. The focus of these forecasts generally does not reflect the production and investment situation desired by the firm. Major sources of this economic trend information for the independent business manager are as follows:

a. The electronic and print media.

b. The firm's accountant.

c. The firm's banker.

d. The owner or manager's stock broker or investment advisor.

e. The "grapevine" -friends and business acquaintances who provide various types and qualities of input.

f. Previous trends in the firm's sales or production.

g. Government recommendations.

h. Financial service publications.

Managers of firms generally form an opinion on the business outlook based on a consensus drawn from any or all of the above sources. This is an informal process, which usually has little, if any, pre-determined format. There is generally no theoretical basis on which to base these methods, and consistency may be a problem. Many advisory services exist which publish so called economic analysis, but most centre on financial market advice. The more noteworthy are rated in a publication called Hulbert's Financial Digest, which rates only market performance.

Firms such as construction contractors must make frequent decisions regarding major capital investments and commitments. Smaller contracts may have a lead time of three to four weeks, while larger contracts, or subcontracts from larger firms, may involve lead times of more than a year. An accurate forecast is needed in determining contract bids and buy/lease/sell capital decisions. Changes in the economic environment cause dramatic changes in construction equipment costs. A forecast for a recession/slow down may, for example, indicate that a low contract bid for next year may be profitable due to an anticipated drop in lease costs. The

same forecast may also indicate that major equipment purchases should be delayed for a couple of years, and that an improved maintenance schedule be adopted. A forecast for an upturn after a recession would indicate a safer capital investment point.

This necessitates forecasting procedures or services which yield satisfactory results, while requiring being timely. This also highlights the need for readily available information with which to generate the forecast.

The rapid technological advances of the last decade have resulted in advances in methods for use in medium to large sized firms, where resources are available for the gathering and processing of economic data. The conditions which have accompanied this recent rapid technological development have also increased the need for more sophisticated methods for the independent firm. Production and investment decisions are constrained to a reduced time frame, requiring a more active role on the part of the manager in understanding the forces which determine the course of the economy. However, the problem of owner/operator forecasting has not been addressed in a satisfactory manner.

1.3 Methodology

The model and methods which follow are adapted from introductory models for understanding and predicting aggregate economic behaviour, but are applied to the operations and decision processes of a business firm, on the micro level. The viewpoint of the manager of the firm is taken.

Economic data is set up in the context of the firm. The generally accepted accounting methods (GAAP) which the firm uses, are used to select the variables which are used to model economic behaviour. Accepted methods of economic analysis for management decisions, such as those in "Economic Analysis for Engineers and Managers", by Sprague and Whittaker[82], will also apply. As this is a practical application, the model is designed to use information available in the print media, with sources listed.

The focus of the model is to provide forecasts of direction or trend, with the expected magnitude of the trend being secondary. Flexibility to accommodate varying degrees of user effort, equipment and sophistication is provided. The range is from manual graphing and interpretation, to statistical analysis.

Historical United States economic data is used for two reasons. Firstly, the relevant data is readily available in many forms. Secondly, the Canadian economy follows closely that of the United States, and can be expected to continue to do so due to the expected free trade agreement.

An integral part of the modelling is to provide insight into the variables and their economic effects. Commentary as to economic significance of events and variables, and departures from established theory is included. It is important for the manager to develop an intuitive understanding of the forces which move the economy. The goal of this aspect is to establish a preliminary base for qualitative analysis. Hopefully, this will also stimulate the model user to develop a deeper

knowledge of the factors which influence economic behaviour, to help make the firm's decision process more effective.

1.3.1 Theoretical Development: A Small Firm's View Of Aggregate Economic Behaviour

The firm's view of national income is developed using the same accounting principles as those commonly used by operating businesses in Canada. Generally accepted accounting principles (GAAP) are followed.

An income statement and balance sheet are developed to establish which variables describe economic behaviour in the same reference terms as used by the firm. This is done by considering the product side of the economy as one firm. These statements are developed first with the government sector as an integral part of the economy, then with the government sector excluded to show only the private sector contribution. Commentary is provided to explain areas where this model differs from conventional economic theory. It is necessary to establish the differences, as this model is strictly from the firm's viewpoint.

1.3.1.1 Determining Changes

In determining changes and trends in the economy as a whole, the economy is assumed to be a positive feedback system, with an adaptive gain in the feedback loop. This is compatible with Rational Expectations Theory[78]. Rational Expectations Theory assumes that the public forms expectations on the basis of previous experience and available information, and adjusts behaviour to reflect what is expected to occur.

Economic activity is not specifically a function of time, but rather a discreet sequence of events, with each event being dependent on previous events.

Simple difference relationships are developed to determine overall rates of change effected by changes in the separate variables. Factors which are to be used in determining overall trends in the economy are thus isolated.

1.3.2 Testing The Theory: Sources Of Data

Information and data used for this work came from Federal Reserve bulletins, and pertain to the U.S. economy. A consistent source of data was a major consideration in this decision. Forecasting methods have been developed for the U. S. economy and are available for comparisons of accuracy. Sources of recommended publications which report the required data as it is released, is included.

1.3.2.1 Statistical Forecasting Methodology

Historical data is analyzed statistically to determine the most effective method for forecasting. The constraint used in this analysis is that the statistical methods and programming must be compatible with micro-computers such as may be used by a small firm. Methods range from multiple regression to time series analysis using Box-Jenkins and generalized least squares methods. The degree of the resulting functions and the respective coefficients are determined, as is the level of

accuracy. Comparisons are then rendered with forecasting methods used by large firms and institutions.

Two statistical packages were used, to reflect two levels of difficulty and sophistication in the statistical analysis. Minitab was chosen because it is the easiest to use, and operates with very straight forward instructions. This package is somewhat limited in scope, however. For example, only crude plots using "*'s" are available for residuals and predicted values. Minitab restricts files to 50 columns, although this can be avoided somewhat by using the matrix capabilities. Biomedical Programs (BMDP) was selected as being representative of the high end of statistical software packages designed for personal computer use. Comparable packages are the Statistical Package for the Social Sciences (SPSS) and the Statistical Analysis System (SAS). These packages also contain a greater variety of statistical tools and graphics capability than Minitab, at the expense of ease of use and equipment requirements, such as random access memory[12][62].

1.3.2.2 Graphical Methods Of Forecasting

Methods of graphing and interpreting the variables, adaptable to either manual graphs or computer generated graphs, such as Lotus 1-2-3 graphs, are provided. The historical data used is appended, as is the Lotus format used. All the graphics displayed were generated using Lotus, to demonstrate what the actual graphs may look like. The size, however, is one half that of the actual Lotus graphs.

Graphs of the key model variables are analyzed to estimate future trends using qualitative methods. External news and information is incorporated in this procedure to determine the reasonableness of the projection.

1.3.2.3 Applying The Model: Industry/Region Specific Application

The method to apply the macro forecast to individual industry groups or regions is outlined. Conventional micro-economic principles are invoked. The application centres on two factors: the income elasticity of demand, and the life cycle concept. Historical data may be comparatively charted or regressed against aggregate economic activity, as measured by the model, to indicate both industry growth as a ratio of GNP (life cycle related), and income related change (demand elasticity).

2 THE FIRM'S VIEW OF THE ECONOMY

The method used to formulate a model of macro-economic activity in terms of the firm, is to set up an income statement and balance sheet, treating the economy as a whole as if it were a business. Most businesses are generally required to use accrual accounting methods as established by Generally Accepted Accounting Principles (GAAP). However, because there are payments and transfers in the economy which are not normally found in the small firm, some assumptions must be made. Any assumptions made reflect GAAP, as would normally be the case with any firm.

2.1 The Income Statement

The first entry on the income statement is revenues. What constitutes revenues? The least controversial item in this category is exports. These are obviously revenue to the national economy. Denote exports by X.

The next, and largest entry to consider is consumer spending. This factor raises some questions. Start with the consumer income and work toward the domestic consumption portion of this income. Remember, the objective is to determine the portion which is spent on domestic production. Consumer income in this model is equivalent to "personal income", denoted by PI. Initially, the government is considered to be a supplier of goods and services to the consumer. Thus, PI is inclusive of personal tax. Spent income must be personal income, PI, less any savings, plus any increase in personal indebtedness, less imports (the portion

representing value added to goods and services purchased prior to entering the domestic economy). Denote net savings by S, the change in personal debt by PD, and imports by M.

Note that savings is not included as income, while debt increases are. This is to match revenues with expenditures. Future income represented by debt, is matched to current expenditure, while current income in the form of savings, is omitted until such time as it is expended.

Government expenditure is normally considered as part of GNP, but is not included herein. Since the government is assumed here to be a supplier of goods and services, government expenditure is a cost incurred in "producing" goods and services for personal (taxpayer) consumption. The revenue is represented by personal taxes paid plus the net increase in government debt (cost to the taxpayer). The question arises as to why the increase in government debt should be considered as revenue. This is due to the fact that the consumer ends up paying the government debt. Government debt is passed on to the consumer in one of three ways: by future tax increases, reduction of wages and/or dividends at the firm level, or, deflation of the currency by issuing more money. This is an example of accrual accounting[35][71]. Future consumer income is used in the current period.

Revenues accruing to any producer of non-consumer goods represent in-process costs in the production of final goods and services, and thus

are represented in the final price of the goods and services. This is merely the value added principle of economic theory, and is used to prevent the double counting of expenditure. Profits, when viewed from an economy wide standpoint, will be considered as part of the production cost of goods and services, which is compatible with the methods used to calculate revenue requirements for an investment.

It can be noted here as well that investment costs, business taxes (direct and indirect) and profits are implicit in the expense associated with final goods and services. Investment analysis considers taxes and profits as a cost to be passed on through the final price of the finished good or service[82]. Investment becomes value added through depreciation expense. It can be seen also that investment is not either revenue, as in conventional economic theory, nor expense. Initial investment is an asset transfer which shows up on the balance sheet.

The following expression for national revenue,(denoted by NR) results:

$$NR = PI - S + PD + X - M$$

Where: PI= Personal Income

S= Savings

PD=Personal Debt

X= Exports

M= Imports

This deviates from the traditional economic view which includes savings and business investment as part of Gross National Product (GNP). We are interested here in modelling aggregate activity strictly from the perspective of the firm.

Costs, or expenses, to match with the revenue are straightforward. Using accepted methods for determining the costs associated with sales we get the following result:

Cost Of Goods Sold = Opening Inventory + Production
- Closing Inventory + Profits.

Cost Of Goods Sold (COGS), represents only consumer goods and services. Why? Because all other goods and services are implicit, through the value added principle, in this cost. Therefore, inventories and production in the equation only pertain to consumer goods or exports.

With government included, all government expenditures represent costs or expense incurred in providing goods and services to the public. These may be direct, or indirect (such as business taxes). Thus, government spending is not a revenue, but an expense in this model.

The final income statement is as follows:

Personal Income

Less: Personal Savings

Less: Imports

Plus: Exports

Plus: Increase in Personal Debt

Plus: Increase in Government Debt

Equals: Gross National Revenue

Opening Inventories

Plus: Current Period Production of Goods and Services

Less: Closing Inventories of Consumer Goods

Plus: Profits on Consumer Goods Sold

Equals: Gross National Expense

Most firms only see the government sector from the cost side (taxes), and thus a private sector view of the economy better reflects what the firm sees and deals with. A private sector formulation requires only the elimination of the appropriate government factors from the previous statement. On the revenue side, taxes are subtracted, while the increase in government debt are not included. On the expense side, only private sector consumer goods and services are to be included. Up to this point, the government was considered as a supplier of final goods and services (defense, medicare, etc.) to the public.

The income statement for the private sector of the economy is as follows:

Personal Income

Less: Taxes and Transfers

Less: Personal Savings

Plus: Increase in Personal Debt

Less: Imports

Plus: Exports

Equals: National Private Sector Revenue

Opening Inventories of Non-Government Consumer Goods

Plus: Production of Non-Government Goods and Services

Less: Closing Inventories of Non-Government Goods

Plus: Profits On Non-Government Goods and Services

Equals: National Private Sector Expense

This income statement represents, in the terms used by small, private firms, the economic activity for a given period of time. In equation form it looks like this:

$$P - \Delta I = DI + \Delta ND + NX$$

Where: P= consumer goods and services production for the period, including profits

Δ I= change in inventories

DI= disposable income (Personal Income less Taxes and Transfers

Δ ND= net change in Personal Debt less Savings

NX= Net Exports (X-M)

2.2 The Balance Sheet

Following is the development of an economy wide balance sheet, using the perspective and methods of the firm. Remembering that profits are considered a cost, there are no retained earnings. This is a reasonable assumption for an economy wide balance sheet in that earnings would either be paid out to consumers (owners or wage earners), or reinvested. If reinvested, they would move on the balance sheet from current asset to long term asset, with no corresponding change in the overall balance.

In this manner, it can be seen that assets are converted to cash and vice versa in the economy. New investment shows up in the equity portion of the balance sheet, as well as the long term asset portion.

The balance sheet for the private sector of the economy (excluding government) looks like this:

Current Assets	**Current Liabilities**
Cash	**Payables**
Receivables	**Loans Due**
Inventory	**Taxes Due**
Long Term Assets	**Long Term Liabilities**
Investment	**Long Term Debt**
Less Accumulated Depreciation	

No mention is made of foreign transfers or cash flows in this

formulation. Direct cash payments and loans only appear as such, regardless of to whom they are owed. The government's international transactions are considered internal to the government. The net cash and debt changes reflect the net changes the public (consumer) and firms must account for. It is assumed that currency and merchandise and services trade behave according to established economic theory, in terms of adjustments and long term effects[6][17][28].

2.3 Summary of Assumptions Made

Developing a macro-economic model from the perspective of the firm requires assumptions which yields a slightly different formulation than conventional economic theory. This is due to the nature of the approach. Economic theory tries to capture the economy from all sides and thus requires additional variables and information which are not germaine to a small firm. Normal operation of a firm takes a narrower view, and requires matching revenue with the appropriate expense, which often requires matching events or transactions that take place in different time periods.

The assumptions which arise in this approach are:

a. Savings are not counted as income. From the standpoint of the firm, there is no expenditure.

b. Increases in personal debt are counted as revenue. This reflects the expenditure of future income today.

c. Government expenditures represent costs of providing goods and services to the public. The revenue (income) matched to this

expense is represented by taxes plus the increase in government debt.

d. Increases in inventories are not considered revenue or income. This item is an asset increase, and thus a balance sheet item. There is no revenue to match to the increase in inventory. This represents future revenue, when the inventory is sold.

e. Investment is not considered as revenue. There is no expense to match it to. Investment represents an asset transfer. Investment becomes an expense to be matched to revenue when it is depreciated in the production of a consumer good or service, and thus becomes part of the value added.

The value added principle implies that all intermediate costs such as investment (by depreciation), materials, labour, etc. are reflected in the final good or service provided to the consumer or destined for export. The correct application of this principle requires matching expenses and revenues from different time periods. An example is an automobile. The expense includes mining iron ore, producing electricity. designing and many other operations which can take place years before the final product is produced and sold. These factors are important from the standpoint of the firm in the decision process.

Macroeconomics, on the other hand, has differing goals, and thus models events in a different manner. Economics seeks to determine the theoretical cause and effect relationships in the economy. This entails the study of the economy as a whole: the consumer, government, the

business sector and international trade. The business decision maker needs to be aware of this. The differing views should be noted, and caution used when reviewing economic reports in the media, as the methods used by economists are not the same as those used in business. Complex economic research and policy planning requires a different frame of reference than production and investment planning in a firm. The study of market clearing forces and adjustment mechanisms, and fine tuning the theoretical implications of these processes is far broader than business planning requirements. Economics, as a science is interested in determining the cause-effect relationships in economic behaviour, while the business person is interested in making money.

3. Determining Change In The Economy

3.1 Using The Model To Understand The Economy

Prior to developing relationships with which to determine expected changes in economic trends, the underlying model, on which changes are based, should be outlined.

The economy operates as a sequence of discreet events[17], with some type of adjustment process between each event. The economy can thus be described as a discreet event sequence with some type of feedback mechanism. This can be thought of as an adaptive feedback function which is based on previous events. We can describe this process as similar to a positive feedback system, with some type of adaptive gain function in the feedback loop.

This feedback gain represents the adaptive effects of the consumer. These effects are caused by the consumer forming expectations of future events based on current information and experience. The resulting change in economic activity is added to the current output level, represented by Gross National Revenue (GNR), as modelled in chapter 2, generating the new or adaptive output level. This is simply rational expectations theory[78] formulated in feedback control theory terms. Here, GNR is the model's equivalent of Gross National Product (GNP) in conventional economic theory.

Using this type of formulation, changes in economic activity represented by G, become a function of all previous events:

$$G = fn(C_t, C_{t-1}, \ldots, C_{t-\infty}, NX_t, NX_{t-1}, \ldots, NX_{t-\infty})$$

where C represents personal consumption and NX represents net exports at all current and previous time periods. This represents an approximation of time interval, as the numbering was chosen to demonstrate the dependence on previous events. This is consistent with methods used in policy and strategy formation and decision processes at both the firm and government level. The firm, when making production and investment decisions, estimates the market for its' goods and services. As all goods and services are represented by final consumer goods and services, or net exports, future trends in these variables determine the ultimate market conditions. The government formulates policies to achieve prescribed goals in economic growth. This entails varying action form stimulating to slowing the economy. As is the case with the firm, this ultimately rests on expected trends in consumption and net exports.

This modelling assumes that new output levels are equal to previous levels plus some change. The change is some function of all the previous economic events. Note that nothing is said here as to the exact nature of the operation of this feedback mechanism. As is the case with control theory, we should be able to determine the performance of this gain based on empirical data without precisely defining causality. We need only to accept the assumption that the economy acts in a sequential manner and adapts on the basis of previous events. Rational expectations theory supports this approach through the principle of adaptive expectations.

This model does not relate to a time base. The economy is not considered to be time dependent, merely sequential. This requires the reliance on empirical data to provide an expected relationship between events and a predictable time base for change. This is an approach commonly used in econometric studies, which attempt to establish time-event relationships based on empirical data.

A characteristic of feedback systems which support the determination of a time relationship is that changes in the gain function are the cumulative result of all previous events and changes. Another factor which assists in relating a time base to predicted changes is that many economic events occur on a regular basis. Financial reporting, holidays, pay periods and political activities tend to be highly regular. Human behaviour being what it is, however, precludes any exact prediction. Any major changes in trend could be expected to be proceeded by certain types of events, while minor trend variations or fluctuations would likely occur randomly.

3.2 Difference Relationships

The income statement developed for the whole economy resulted in the following relationship:

Production - Net Inventory Change =

Disposable Income + Net Debt Change + Net Exports

Or, using the prescribed variables:

$$P - \Delta I = DI + \Delta ND + NX$$

Rearranging the terms to reflect the desire to determine production levels, which is the goal of the forecast to be developed, we get:

$$P = DI + \Delta ND + NX + \Delta I$$

Using the first total differential, assuming independence, to describe change:

$$\Delta P = \Delta DI + \Delta^2 ND + \Delta NX + \Delta^2 I$$

- It should be stressed that the feedback model does not assume that the variables are independent. In fact, the model would indicate that the variables are correlated. We now have a basis to establish production change, determined by the predicted change in four variables, if the covariate relationships may be determined. Of the four components, two are second difference relationships, while two are first order.

Disposable income is a composite figure which has taxes and some minor transfers such as federal pension contributions included. The net debt factor is composed of total borrowing less net saving for the period. Net Exports and Inventories are single items.

These relationships lead to the following:

$$\Delta DI = \Delta PI - \Delta T - \Delta TR$$

And

$$\Delta ND = \Delta PD - \Delta S$$

Where: DI= Disposable Income

PI= Personal Income

T= Taxes

TR= Transfer Payments

ND= Net Debt

PD= Personal Debt

S= Savings

Implicit in the difference relationships are additional factors which contribute to changes in consumption levels and net exports. While investment is not modelled as income, changes in investment result in changes in income. Consumption is approximately dependent on the rate of change of investment. In the simple case, where investment remains constant, consumption brought on by this investment would not change appreciably. An example of this type of consumption is wages paid to workers in the construction of a new plant. This consumption will vary as the rate of investment varies from period to period. It may be noted that this investment change, as with other investment decisions, should be determined by expected trends in consumer behaviour and exports.

Tax changes also affect consumption levels, as does central bank policy. Some research indicates that consumption varies with income levels[20], so the group most affected by policy changes will be expected to dominate. This work assumes that most policy changes affect the so called "middle class", who comprise the bulk of the consuming public. Representing Personal Consumption with C and Personal Taxes with T, this relationship can be expressed as:

$$\Delta C / \Delta T \approx 1.$$

Currency changes affect the net export level of the economy, but evidence shows that this is a very slow process[13][14]. Lag periods may extend up to months or years, giving ample advance warning of production adjustments. Since the rate of change would be highly variable and very dependent on individual product elasticities, separate analysis would be required to determine the specific change rates. Overall rates:

$$0 < \Delta NX/\Delta ER < 1$$

ER= the exchange rate.

In determining rates of change of general economic activity, these factors will be assumed to be implicit in the adaptive expectations which determine the variable changes in our equation. Most policy decisions are well reported and are assumed here to be implicit in the adaptive process as well. The same case can be made for foreign policy decisions. This, however, requires caution. Political and economic stability should be evaluated in these instances.

3.3 The Final Equation

Collecting all the terms, we arrive at:

$$\Delta P = \Delta DI + \Delta^2 ND + \Delta NX + \Delta^2 I$$

$$= \Delta PI - \Delta T - \Delta TR + \Delta^2 PD - \Delta^2 S + \Delta NX + \Delta^2 I$$

Production is determined by predicting changes in seven variables, and estimating the covariate relationships between the variables. Reliable data on each variable, or reliable data on composites of two or more of the variables is required for evaluation, prediction and verification.

4. DATA ACQUISITION AND PREPARATION

4.1 Sources Of Data

Both the regression and graphical analysis require the collection of data to reflect the variables considered. Some of the variables must be calculated using published data, and some of the information must be estimated from graphical releases. Historical data was acquired from three sources: The Business Conditions Digest[88], The Federal Reserve Bulletin[13], and The Historical Chart Book[14]. The historical values were obtained from single charts or tables for the complete period from 1953 to 1986. It is assumed that the consistency of the data would be enhanced by obtaining the material from a single source where possible.

These sources also contain additional useful information in both tabular and chart form, and provide an inexpensive method of graphically observing economic activity, both on the aggregate level and in specific industries. Data on virtually every sector of the U.S. economy is tabulated or charted in these sources. Regional information, however, must be obtained from regional government sources. Data for the Alberta economy was obtained from Alberta Treasury publications[1].

These sources are recommended as the basis of historical data, and should be used to update data obtained in the short term from other sources. This provides a consistent data base, or rather a more consistent one, given that the data tends to "float" somewhat.

Daily and weekly newspapers and financial papers and magazines also

provide the required information on a regular basis. Care must be taken in using data from these sources, as it may often be "real", "current", "seasonally adjusted", "smoothed", "annual equivalent" or some other variation on the adultery theme. Data of any form is seldom reported in a readily useable form for this analysis, and may not be very consistent. Another factor is that data from these other sources is reported at different time periods, and buried among other financial information, making it difficult to collect.

4.2 Problems Obtaining Data

Two categories of problems arise in obtaining the necessary data to be used in the analysis. First, the required groups are not conveniently reported. Secondly, the data is "rubbery", in that there are many revisions and changes in the data which may or may not be reported. Data collection methods reduce the effectiveness of the data. Accumulation and reporting takes place over intervals of time, with no common reporting period for all data. With an assumed interdependence of all economic activity, time lags between reporting of differing types of data make isolating the different contributions of the variables difficult, due to interactive effects during the reporting lag.

Changes in taxes and transfer payments are not frequently reported. Disposable income figures, which are net of taxes and transfer payments are, though, and can be used as substitutes.

A major problem occurs in the failure to report changes in household

debt in the areas of home mortgages and home equity financing. Without this information, the net saving or debt changes cannot be calculated. It should be noted here that differences exist between existing and new home purchases. Down payments on new homes are a decrease in savings, while those on existing homes may or may not be. Purchases from individuals are transfers of savings from one individual to the next, while purchases from a firm are decreases in savings. Another important factor is that only the increase in value of the existing homes is considered income. The information required to determine all of these factors is not all reported in any form.

The method of reporting home purchases results in a very cumbersome process for determining changes in debt and savings. The following are reported in the Federal Reserve Bulletin: New home sales, average unit price, and the ratio of mortgage to purchase price, existing home sales volume and average unit price are reported, but not the ratio of mortgage to purchase price. Total change in household mortgage debt figures are available in chart form, but not tabulated. The existing home sales data prevent an accurate breakdown of down payment versus mortgage. Information may or may not be obtained directly from the Federal Reserve Board on special request (their response was unclear). Alternatively, an estimate of the desired data may be obtained from the charted value, by using a scale to measure the quantity desired. This presents some difficulty, but will provide a reasonable proxy for mortgage debt data.

Currently, savings is calculated as merely the difference between

disposable income and personal consumption spending. Home purchases are considered as private investment. This creates a confusing view of the actual economic activity. The down payment may represent a decrease in saving but will not show in the calculated saving rate. On the other hand, from the production standpoint, home sales are final, not investment. The irregular and incomplete reporting of this information makes the estimation of changes in the housing sector of the economy difficult.

Personal consumption is reported regularly, and represents virtually all non housing and personal investment expenditure by the public. This quantity includes non-mortgage debt implicitly, and may be used as a predictor for the non-housing sector of domestic income.

Imports and exports are reported regularly, as are changes in finished goods inventories.

The nature of the data gathering and handling processes also creates problems with the data. Surveys are done in each area of interest to the Federal Reserve Board, and then aggregate quantities are estimated from the surveys. The variability of the results are not published with the results, and changes in estimating procedure are not always published. Studying historical data charts reveals many changes in "historical" data after the fact. While many of the changes are denoted by "r", signifying a revision, many just appear.

Calculations necessary to render some of the data useful also create

another source of error. Ratios, such as those for mortgage debt versus home price are estimates, and have variability and round off error, when multiplied by price (an estimated quantity) increase the overall level of error.

4.3 Data Requirements For Analysis

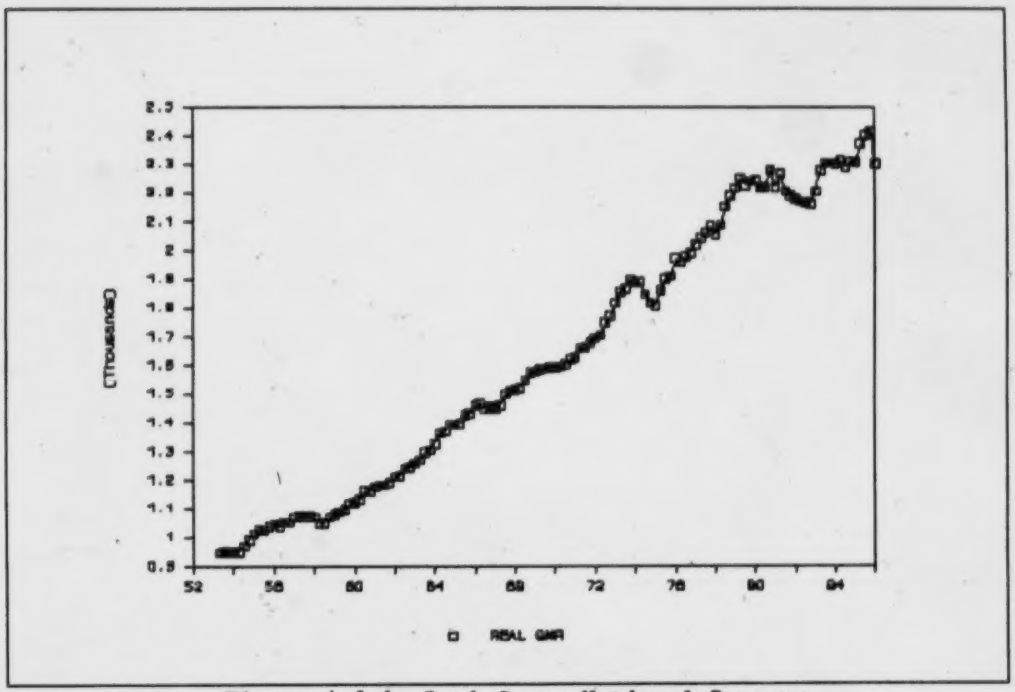


Figure 4.3.1 Real Gross National Revenue

The first information required is a measure of the overall level of economic activity. This quantity is represented by Gross National Revenue in the model previously developed. The values were calculated using the formula:

GNR = Personal Consumption + Home Purchases + Net Exports

Personal Consumption figures are published quarterly, and were used directly. The current dollar values were used. Home purchases were calculated by estimating the change in home mortgages as a percent of personal income, assuming a three to one ratio between down payment and mortgage (conventional ratio), and calculating the dollar value based on four thirds of the mortgage ratio. This is not accurate, but uses readily available information, which is required by the scope of the analysis. Net Exports are reported on both a monthly and quarterly basis. Quarterly figures were used.

Personal Consumption plus Home Purchases is also equal to Personal Income plus the change in Personal Debt less the change in Personal Savings. This requires collecting data on Consumer Instalment Credit, which is reported monthly and quarterly, and estimating other non-mortgage debt from the Monthly Chart Book graphs of household debt as a percent of Personal Income.

To give a better comparison between time periods, the level of activity should be adjusted for inflationary effects. This is accomplished by using the Implicit Price Deflator, or GNE Deflator. This adjustment yields Real GNR, as shown in Fig. 4.3.1. Real values are calculated by multiplying the nominal value by 100/GNE, where GNE represents the GNE deflator. The GNE Deflator is reported quarterly, not monthly, so

conversions of data to "real" values between reporting periods will involve estimating of this parameter. As it changes slowly, a good assumption is that it is constant throughout the period.

It is desirable to have a measure of savings in the economy. Current calculations are unacceptable, as they do not allow for down payment on homes, and the resultant effect on savings. The necessary information is not conveniently reported, but can be estimated. Personal expenditures can be calculated, as can personal income plus increased debt. If we take the change in income and subtract the change in expenditure, we arrive at a measure reflecting the change in savings rate. In calculating this measure, debt changes are accrued as income for the period. This helps separate debt effects from income and saving effects. Without knowing the actual level of saving, we can calculate the change in the level for the quarter. An estimate for down payment on mortgages of 25% is used in this calculation. Historical data in the Federal Reserve Bulletin indicates that this is reasonable. The value calculated reduces to the difference between personal income and personal consumption plus down payment.

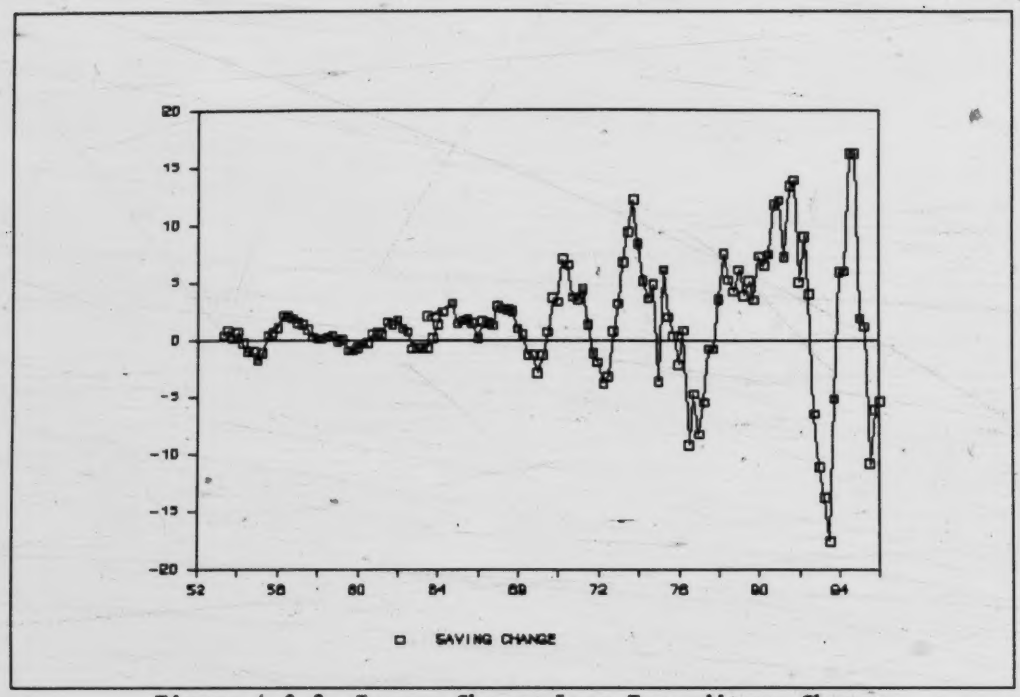


Figure 4.3.2 Income Change Less Expenditure Change

Figure 4.3.2 shows a four period moving average smoothing of this difference. This smoothing was done to preserve the trend effects of the changes, while reducing the volatility, to give a better view of direction.

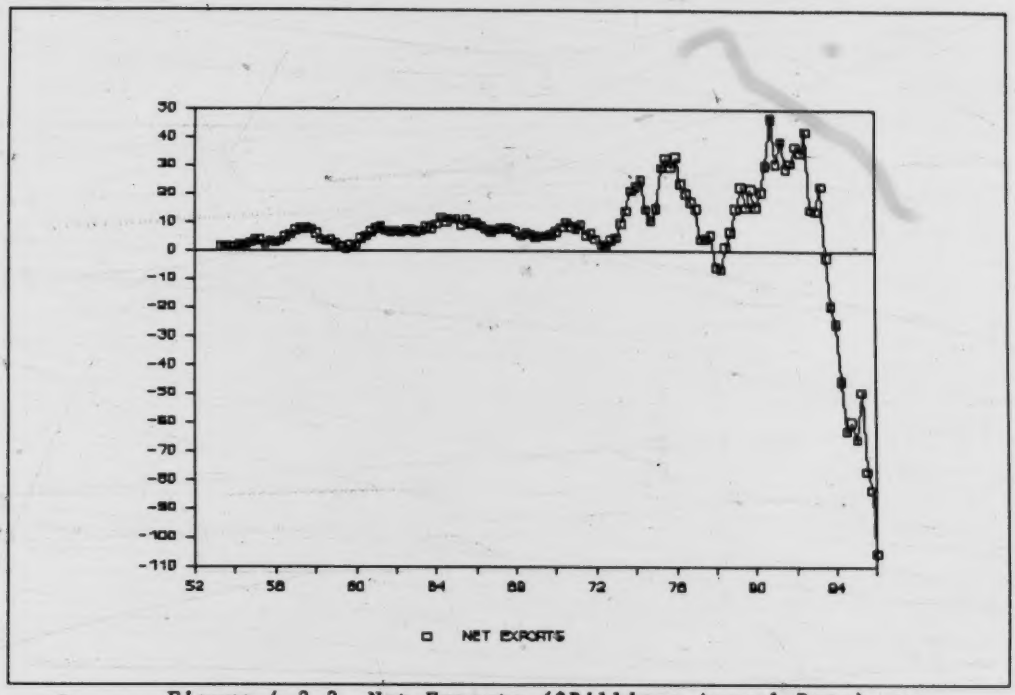


Figure 4.3.3 Net Exports ($Billions Annual Rate)

Net exports are a small part of the U.S. economy, but receive much attention. Many heated political debates are generated by trade figures. These figures (displayed in Fig.4.3.3), previously described, were also maintained separately to be used to indicate possible changes in policy arising from trade problems. This can lead to movement on the currency and financial markets. Following trade balance data will give an indication of possible currency trends.

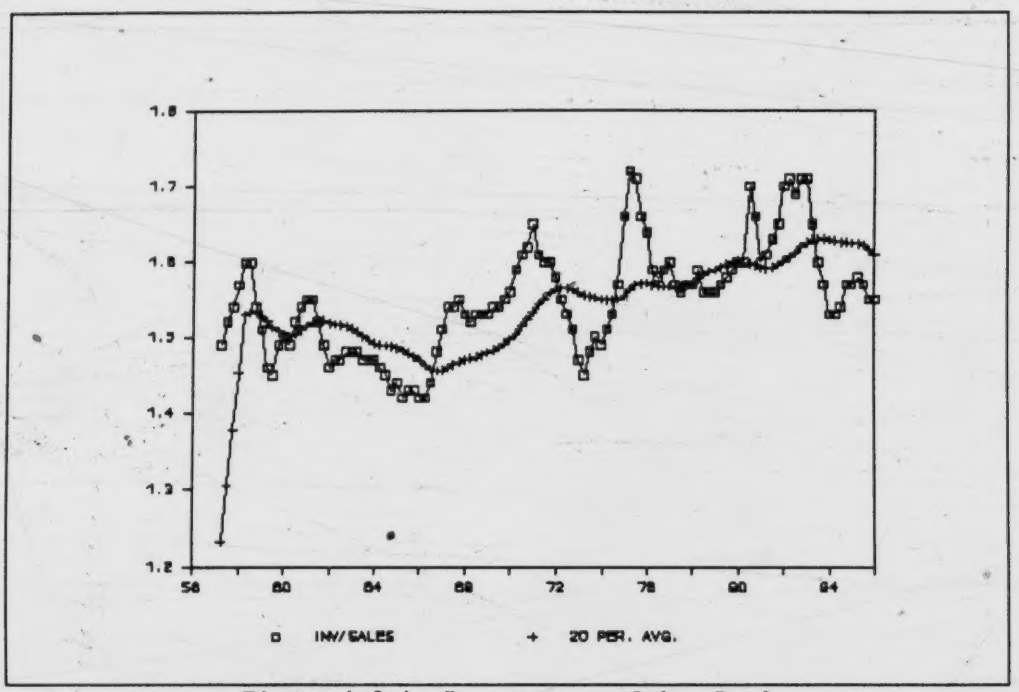


Figure 4.3.4 Inventory to Sales Ratio

Inventories are a costly part of most business ventures, therefore one would expect them to be important in determining the course of the economy. The most convenient reporting of inventory information is the inventory to sales ratio (Fig. 4.3.4). This figure reduces the sensitivity of the gross dollar values by reducing the level effects, and focusing on production effects. Inventories of final goods, when converted to a ratio of overall activity, show no improvement over the regularly reported inventory to sales ratio. This ratio is reported both monthly and quarterly. The quarterly figures reflect the trends adequately for the model proposed. To determine trends in inventory to sales ratio a 20 Quarter moving average was selected as a reasonable proxy for the short term trend.

Debt is an important variable in the model proposed. The two questions which arise regarding debt are whether the level of debt or the ratio of debt are more important. The use of a ratio eliminates the need to convert data to real values, but still retains all the pertinent information about debt. The actual level of debt is important with respect to income level i.e. the ability to repay.Two types of debt were chosen. Total debt, Figure 4.3.5, was chosen to reflect the overall debt burden of the consumer.

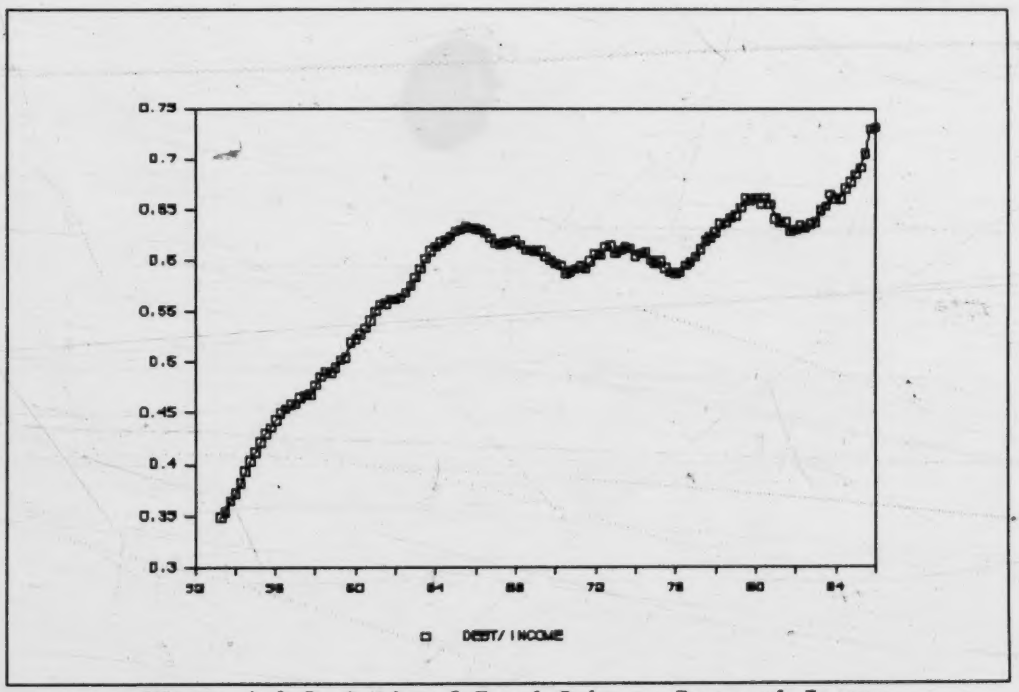


Figure 4.3.5 Ratio of Total Debt to Personal Income

The debt ratios were calculated from data released quarterly. A proxy for personal debt which is reported monthly is Consumer Instalment Credit, Figure 4.3.6. The ratio of Consumer Instalment Credit to Personal Income is used as a short term measure, and also a measure which is more sensitive to short term interest rate fluctuations. The total debt load is more influenced by longer term rates, because it includes home mortgages, whose rates change more slowly than consumer loan rates.

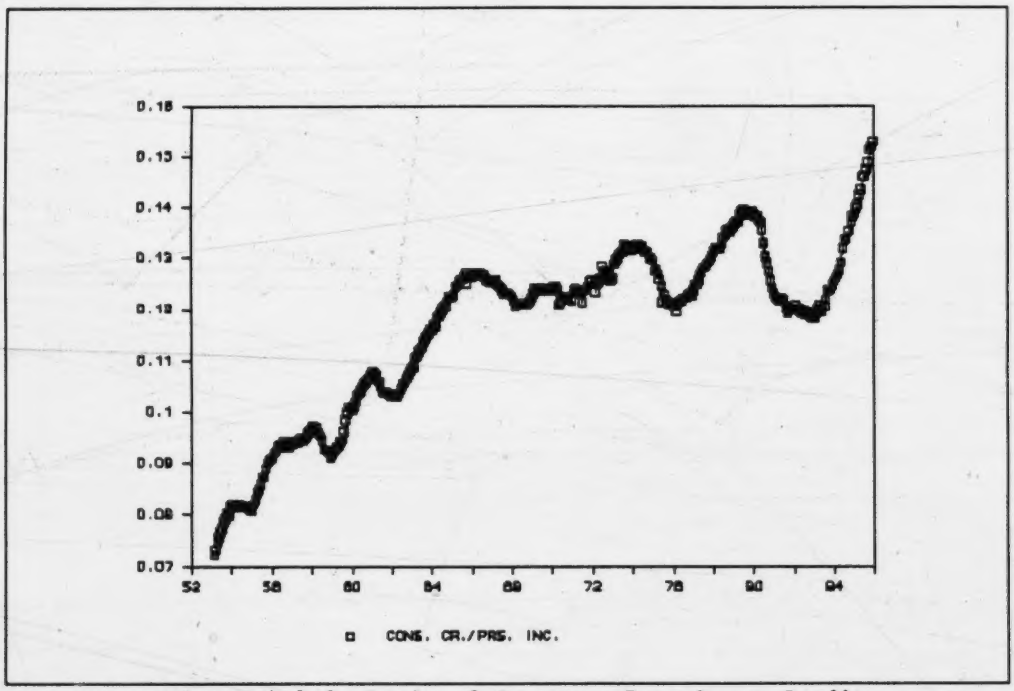


Figure 4.3.6 Ratio of Consumer Instalment Credit to Personal Income

Application in a specific area (to be covered later) necessitates gathering information in the related area(s). This data can be tabulated with the standard data above, or kept in a separate file.

4.4 Summary Of Required Data

The specific information which needs to be tabulated for general analysis is as follows:

1. Personal Income (quarterly and monthly).
2. Personal Consumption.
3. Household Borrowing for the period.
4. Monthly Consumer Instalment Credit Outstanding.
5. The Implicit Price Deflator (GNE Deflator).
6. Net Exports.
7. Inventory to Sales Ratio.
8. Down payment on Home Purchases.

4.5 Initial Data Acquisition And Handling

Prior to any statistical or graphical analysis, it is advisable to take a look at the data in graph form to determine which methods may give the best results. To accomplish this, the data was entered into a Lotus spreadsheet, columns were established for both raw data and calculated values, and plots produced for the variables under consideration.

The plots required are the following:

1. Real Gross National Revenue.
2. The difference between the change in Personal Expenditure and

the change in Personal Income, with two period moving average smoothing.

3. The Total Personal Debt to Income ratio.

4. The ratio of Consumer Instalment Debt to Personal Income (monthly).

5. The Inventory to Sales Ratio with 20 period moving average smoothing, and running average smoothing previous values.

These plots, most of which are included in the publications listed will provide the basis for graphical analysis of economic activity. Other supporting graphs and information in these publications will be used as well, such as interest rate charts, commodity price charts, and specific industry information. When plots are made, effort should be taken to preserve the nature of the data. Fluctuations should not be smoothed out of the graphs prior to analyzing the graphs to determine which type of smoothing, if any will best reflect the true underlying trend. Long term aggregate trends and long term debt curves which are fairly smooth help give a feel for the effects of change, but near term analysis requires the visible impression of the period to period changes.

4.6 Checking The Assumptions

Immediately after acquiring the data, plots were generated of the variables which were used in other than a conventional manner. These were inventories, as represented by the inventory to sales ratio, business investment, as represented by commercial loans outstanding, and the first and second order of change of personal debt.

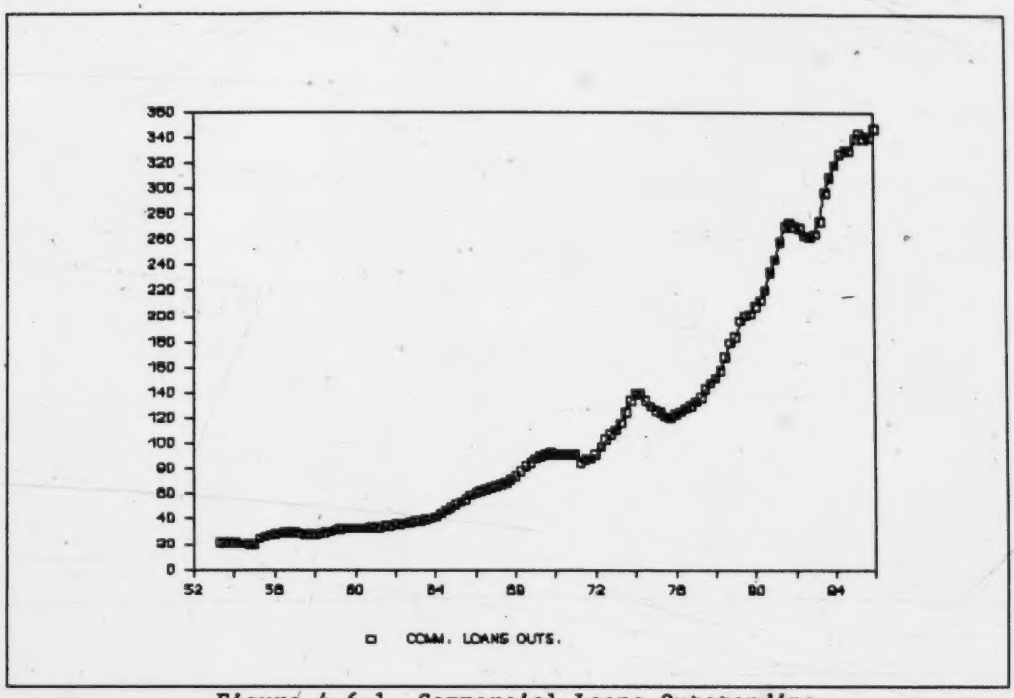


Figure 4.6.1 Commercial Loans Outstanding

Comparing the graph of Inventory to Sales Ratio, Fig. 4.3.4, with Gross National Revenue, Fig. 4.3.1, it can be seen that the trend in inventories, as measured by the inventory to sales ratio, remains up while expenditure is down, as expected.

Turning to business investment, compare Figure 4.6.1, Commercial Loans Outstanding, to Gross National Revenue, Fig. 4.3.1. In this comparison, business loans often continue to increase at times when GNR, which reflects consumer spending and exports begins to decrease. This may reflect the need for increased financing for inventories and other costs while sales are slowing, as well as late reaction to the trend.

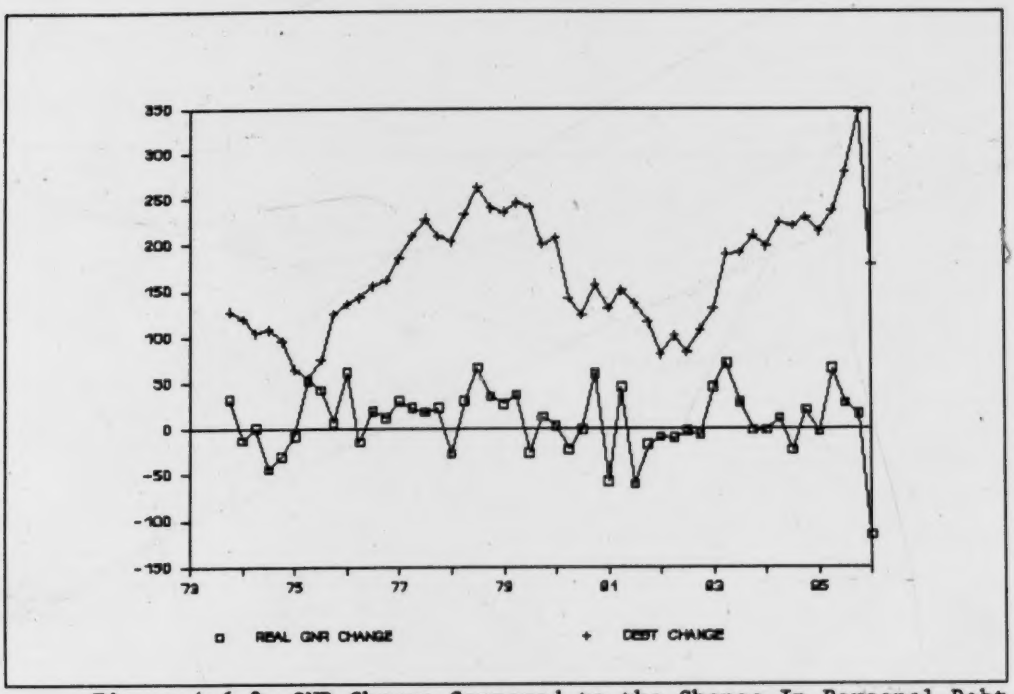


Figure 4.6.2 GNR Change Compared to the Change In Personal Debt

These two comparisons show that counting inventory and investment increases as income, as indicated by conventional GNP measures, may send confusing signals to the small business manager. With production and capital investment decisions being the focus behind the analysis, removal of mixed signals is important.

Graphical support should be shown for the idea that the change in economic activity is related to the second order change in personal debt. Figure 4.6.2 shows the change in personal debt compared to the change in GNR. Note on the graph that when the change in debt is increasing, the change in GNR has an approximately constant positive trend. When the debt change trend flattens out, the GNR trend turns down, and when the debt

trend turns down, the GNR trend flattens out in the negative region.

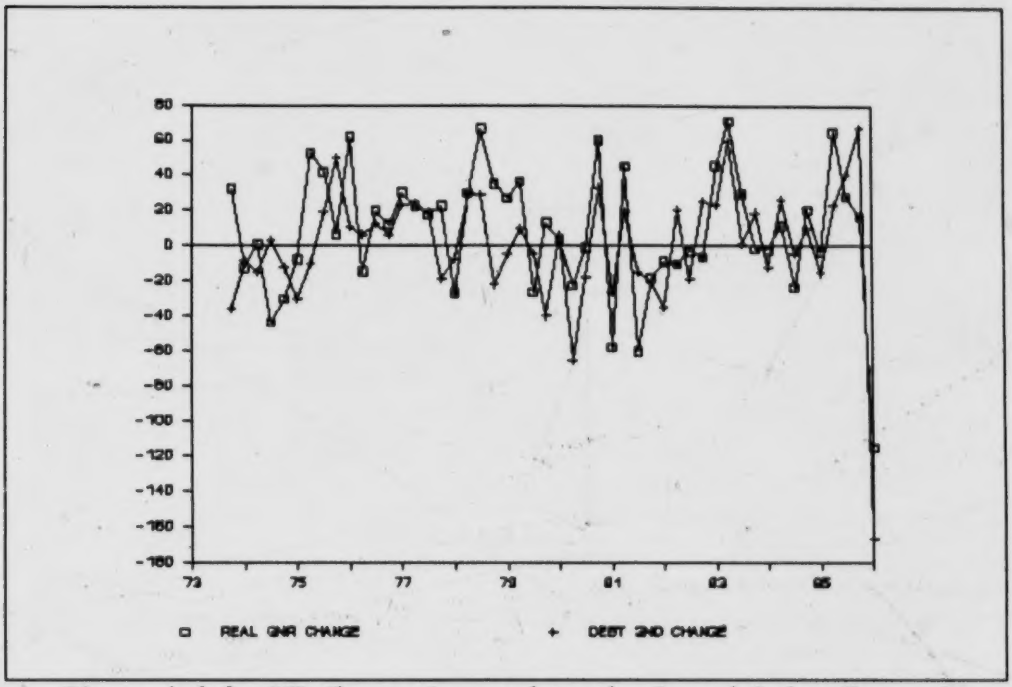


Figure 4.6.3 GNR Change Compared to the Second Order Change in Personal Debt

Figure 4.6.3, the second order change in personal debt demonstrates the relationship more closely. The data has a distributed relationship, in that it varies from lead to lag, but the graphical representations of the data do lend some credence to the assumption of a relationship between the second order change in debt and the first order change in economic activity.

5. STATISTICAL FORECASTING METHODS

5.1 Methods Evaluated

Three methods were considered for use in forecasting future economic activity. These were Time Series analysis and regression analysis using statistical packages for personal computers, and regression using Lotus 1-2-3. The statistical software used was BMDP and Minitab.

Time series analysis yielded very poor results. As an example of how poor, Straight line regression provided better results. The GNR time series was the object of this analysis. Both the gross value and the first order change were studied. Prediction of the level was more accurate than the change, but both were poor, yielding useless predictions. Various differencing combinations were tried, as were log, normalized and price adjusted (real) transformations. All failed to create a stationary series.

The autocorrelation functions and partial autocorrelation functions of the GNR showed declining correlations, while the same functions for the change showed small sample correlations for more than 30 lags. The various transformations produced some interesting designs, but none of any use. Some were nearly symmetric and appeared repeating in a harmonic fashion, but could not be manipulated into a stationary series.

These results give credence to the assumed behaviour of the economy. A positive feedback system with an adaptive gain function in the feedback loop should show correlations through long lag periods, with the correlation being difficult to track due to the adaptive nature of the

gain function.

Multiple regression using the same variables as those graphed, to predict GNR level, gave favourable results for one quarter forecasts. Errors were largest where changes in trend occurred. Yearly and longer forecasts were no better than guessing. Standard error (though not reliable) ranged from one half to one percent of GNR, or thirty to fifty percent of change. This in line with current institutional forecasts, which are produced at less timely intervals.

The actual regression procedure involved identifying which variable combinations would yield the best results based on the model description. Differences of up to eight were tried, as were nonlinear variables. Problems arose with both cross and serial correlation in the data. Methods used to skirt this problem were to convert the data by using rates, ratios, differences between variables and normalized variables. In many instances, these still produced "singular matrix" errors when attempting to regress the variables. Observing the X^TX matrix in both regular and inverted form revealed the problems. Another problem which was a characteristic of the data was that of heteroscedacity (non-constant variance). The variances of the data, especially in converted form could not be expected to be either the same or constant throughout the range. This implies that the estimators, though still unbiased, are not minimum variance. Further evidence of this was given by high correlation values with low significance of the individual estimators.

The final option considered to deal with these problems was to

utilize the matrix capability of the software to run a generalized least squares regression. This method yielded no results. There is currently no straightforward method of developing the necessary weighting matrix to allow for the differing variances and covariances present. A trial and error simulation method was considered, using guessed relationships, but proved too complex for individual applications.

Attempting to use the software packages identified another problem, that of adding variables to improve the fit. When using highly correlated data, one cannot be certain of the significance of each variable entered. The analysis using the multiple regression capability of Lotus 1-2-3 verified this by giving results comparable with less than 50% increase in standard error.

The Lotus regression showed more standard error but similar correlation coefficient (99.8 vs. 99.9). More significantly, the predicted values for the next quarter were within 20% of those predicted by more variables. As with the statistical software packages, spikes occurred in the actual error when changes of trend occurred.

Both methods gave poor results when used to predict periods greater than two quarters. Lags became prominent, rendering the forecast values useless. Better results for longer term were obtained using nominal values and an exponential relation (log regression). This result should be apparent from viewing the nominal values for GNR. The trend has never been down. At times, the rate of increase has slowed, with actual decreases in

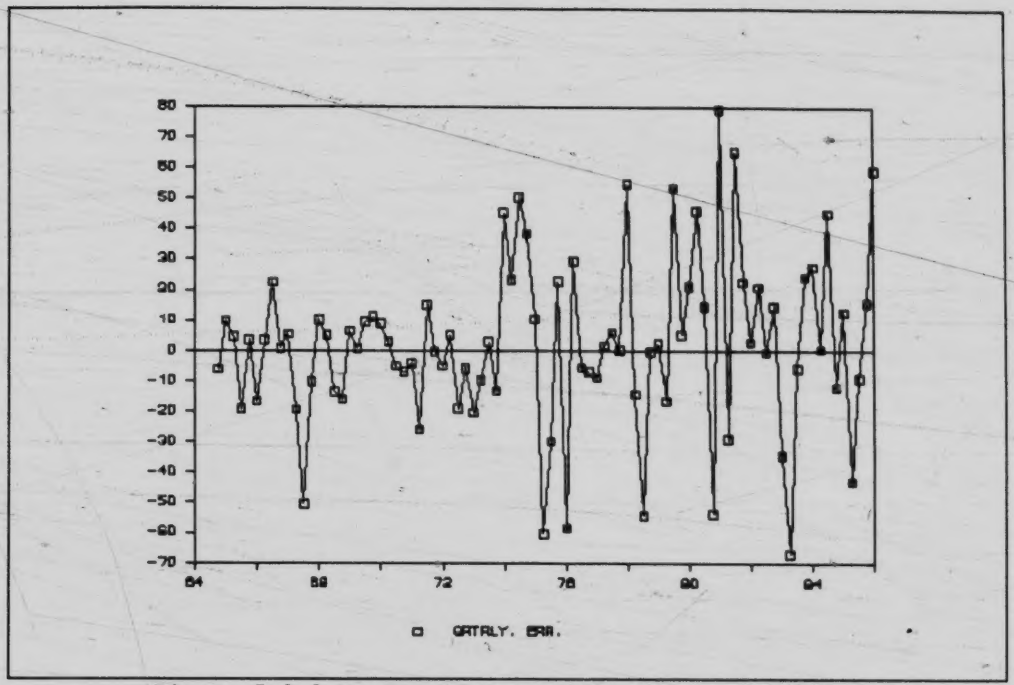


Figure 5.1.1 Quarterly Regression Error ($billions)

value happening only three times. The problem with this is that without knowing the inflation rate, only a guess is obtained as to the real level of economic activity. The long term implication is that, in nominal terms, there will be steady growth. Recessions, though are "real", but fortunately are a short to medium consideration in the decision process.

Long term projections may be enhanced by using the previously described graphical methods to predict when a change in trend may occur. Figures 5.1.1 and 5.1.2 show the regression error for quarterly and yearly forecasts using Lotus. The error resulting from more complex regression showed less variance, but the same general pattern. The plots shown, done with Lotus, show the change in billions of dollars, annualized.

5.2 Method Selection

The most accurate regression forecast for quarterly prediction was achieved using the Lotus regression procedure on the level of GNR versus previous levels and one to seven differences, and adjusting with a smoothed value based on previous error. The smoothed value which gave the most favourable results was achieved by using two thirds of the previous two errors. Yearly and longer forecasts were most effectively obtained by extrapolating the recent trend and adjusting for expected changes of trend as predicted by graphical means.

The resulting error in the quarterly forecast was in the order of 50-60% for determining change. This compares with methods employed by larger firms.

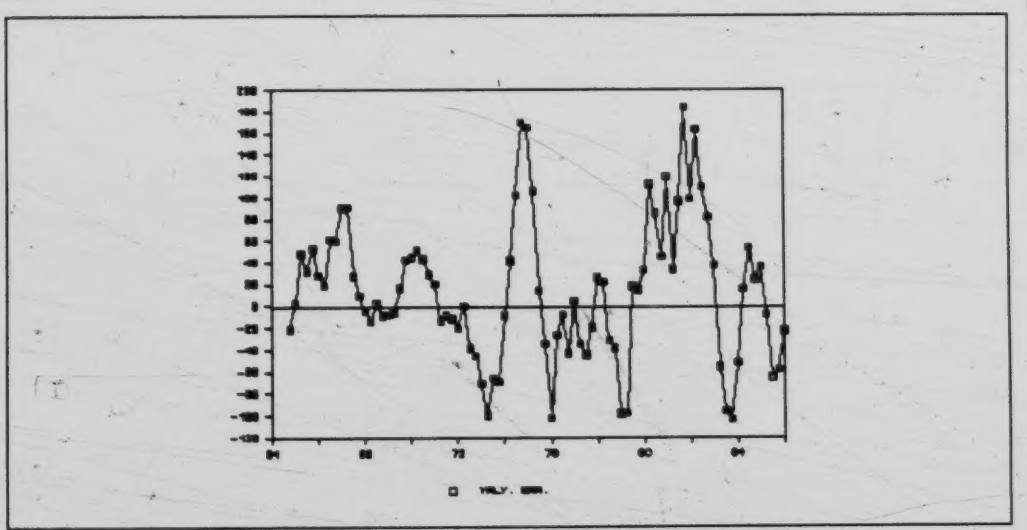


Figure 5.1.2 Yearly Regression Error ($billions)

The choice of the Lotus based method was enhanced by the ease of graphing as well as the regression capability. Forecast error spikes may be detected by plotting predicted values and visually verifying if they are reasonable. Large errors may sometimes be detected in this manner.

5.3 Effectiveness

Statistical methods which may be used conveniently by casual users have not been suitably developed. To completely analyze the available data to determine the levels of contribution to economic change and correlation to other variables is beyond the scope of most business people. Regression of up to 8 variables, which Lotus will do, will provide a reasonable forecast of the next quarter. Error increases with the lead time and requires adjustment for potential trend changes. This adjustment can be effected more easily by using manual techniques. Computer analysis will not, in the small business environment, improve the forecasting of major trend changes in the economy, as compared to graphical methods. Since it is often more important, for the small business person, to know whether or not the trend is about to make a major change, rather than the degree of change, graphical methods prove superior. The main advantage of the computer in a small business application is not the potential for statistical analysis, but rather the ability to generate graphs from data more readily than can be accomplished manually.

In comparison to published economic forecasts, the statistical methods are in the same ball park in terms of trend. The August 8, 1988 issue of The Edmonton Journal carried an article by Seymour Friedland for

the Financial Times News Service, which described economic forecasts as being the same as tossing a coin. The source quoted in the article was the American Statistical Association. This contradicts earlier published material[52], but must be taken seriously, as the source is highly respected. The previous material claimed accuracy of 1% of GNP or 50-75% of changes in GNP. The Harvard Business Review[11] took an intermediate stance which recognized the variability in the accuracy of current forecasts, but acknowledged the need for some type of forecast, and recommended the use of more than one forecast to smooth out bias and error.

6. GRAPHICAL ANALYSIS FOR FORECASTING

6.1 Overview

Graphical analysis is composed of two parts. The obvious part is that of observing and analyzing the graphical representations of the model variables. This was done by treating each variable separately. The second, and equally important aspect is that of corroborating the data with other events which are reported in the media. Qualitative analysis[5] was then applied using the criteria laid out in each section.

When analyzing graphs it is important to be aware of trends and violations of trends. A close look at the graph will give an impression of what is happening. A ruler and pencil should be utilized to give an indication of areas where changes of trend may be expected. These usually occur after long term trends have been broken. Drawing lines to bracket the vertical range of data, and observing how these lines, called "support" and "resistance" lines gives indication as to possible changes in long term trends. It is also highly important when using judgemental methods that more than one or two indicators be used.

Observing reported events and comparing them to the hard data will develop understanding with regards to the almost living nature of economic activity. The various shifts and flows of which particular types of conditions and parameters hold the most control are often better felt than quantified. Galbraith[33] commented that sometimes the numbers describe the economy, and sometimes non-numeric descriptions are best. By analyzing a cross section of data, we let the graphs and supporting information, such

as policy, commodity movements and things such as weather patterns form a consensus of where things are headed. Objective views from different angles enable one person to develop a consensus opinion as to where the economy is headed based on these views. The major consideration in any objective analysis, however, is to be impartial and remove "hopes" and biases from the procedure. The economy does not know you and your desires, nor does it care.

6.2 Gross National Revenue

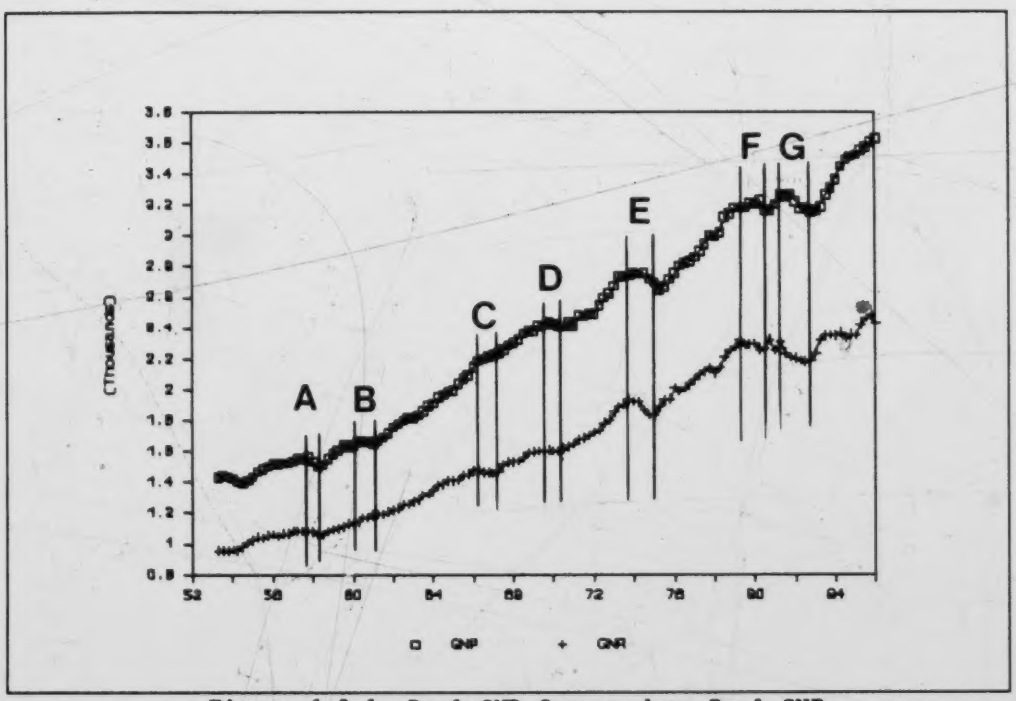


Figure 6.2.1 Real GNR Compared to Real GNP

The first step in the analysis is to plot, from the Lotus file, Gross National Revenue (GNR), as described in the model (Chap. 3). Figure 6.2.1 shows GNR as well as the more conventional Gross National Product (GNP) measure. Peaks, troughs and regions of flattening slope in the graphs should be marked with vertical lines. Next, label the ranges between the peaks and subsequent troughs, and regions of flat growth to denote the separate slow downs in the economy. This procedure will be followed with each figure to mark changes. For this, and each graph following, apply the criteria discussed to observe the characteristics before each trend change.

Spots where the trend is flat (no growth) are be noted as well, as they are slow downs in the economy. These lines provide the reference times for trend changes in the economy, which is the goal of the analysis. Remember that these changes in growth patterns are not the same as commonly reported "GNP" figures.

A comparison with conventional GNP data[6] shows that there were more slow downs in GNR than GNP (Fig. 6.2.1). The Business Conditions Digest[88] indicates recessions or slow downs in the economy for the following periods, with graph labels noted:

1. From the second quarter of 1953 to the middle of the second quarter of 1954.

2. From the end of the third quarter of 1957 to the end of the first quarter of 1958 (labelled A).

C. From the middle of the second quarter of 1960 to the first

quarter of 1961 (labelled B).

D. From the end of the fourth quarter of 1969 to the fourth quarter of 1970 (labelled D).

E. From the end of 1973 to the first quarter of 1975 (labelled E).

F. From the end of 1979 to the end of the second quarter of 1980 (labelled F).

G. From the end of the second quarter of 1981 to the fourth quarter of 1982 (labelled G).

The 1958, 1960, 1970, 1973 and 1980 recessions were indicated one quarter (1973) to four quarters (1980) ahead of actual reported (GNP) recessions using the GNR measure. The measure for GNR showed a downturn the 1966-67 period, while more conventional methods (GNP) showed growth. This disparity reflects the difference in focus- the concern here is personal consumption and net exports, where business revenues are generated.

Rebounds in the economy, as indicated by the GNR graph occurred from two quarters early to the same time as GNP measured change.

Items of note in the sixties were the Kennedy tax cut, proposed near the beginning of the decade, and implemented fully by 1964, the Vietnam War, which saw major U.S. involvement by the mid-sixties, and the tax increases of the late sixties, beginning in 1968. The tax increase had a twofold purpose, to slow the economy by removing the stimulus of the previous tax cuts, and to help finance the war. These events contributed

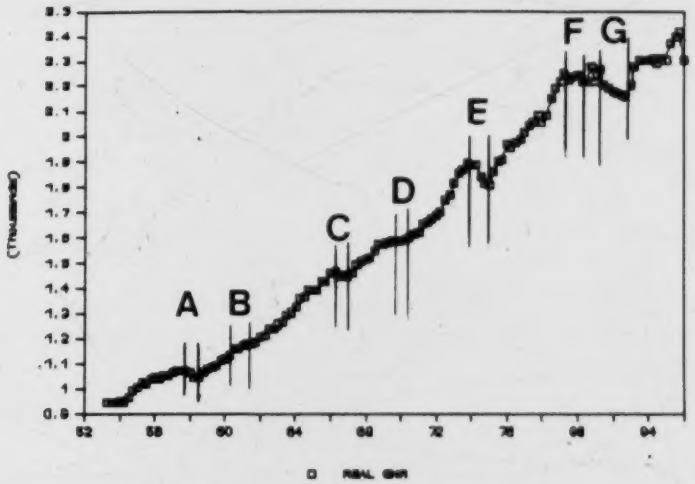
to the mild recession of 1970[17].

The volatility in ecoromic activity after 1970 should be noted. After 1971, the U.S. was off the gold standard, moving to unbacked paper money, and shifting to monetary policy as a means to control economic activity. International trade conducted in $U.S. was no longer fixed in terms of relative currency values. This factor relates to the importance of debt in the proposed model. One additional item from this period was the withdrawal of American troops from Vietnam. This put a damper on the economy, which was accustomed to war related industrial growth.

6.3 Changes In Savings Rates

The long term trend in GNR (Fig. 6.2.1) is up, with fluctuations along the way. The major component of GNR is Personal Income. We need another measure which may reflect expected personal income changes. This is reflected in the change of income less change of expenditure measure. Is the savings rate increasing or decreasing relative to expenditure? This is important in that savings are potential consumption. A drop in savings rate is equivalent to increased use of income now versus income later from the firms' perspective, indicating reduced future personal expenditure. Increases in savings rate indicate the opposite.

As described earlier, the change in personal expenditure is subtracted from the change in personal income, to indicate the change in the savings rate. Figure 6.3.1 shows a four period moving average smoothing of this quantity. The smoothing was done to preserve, on



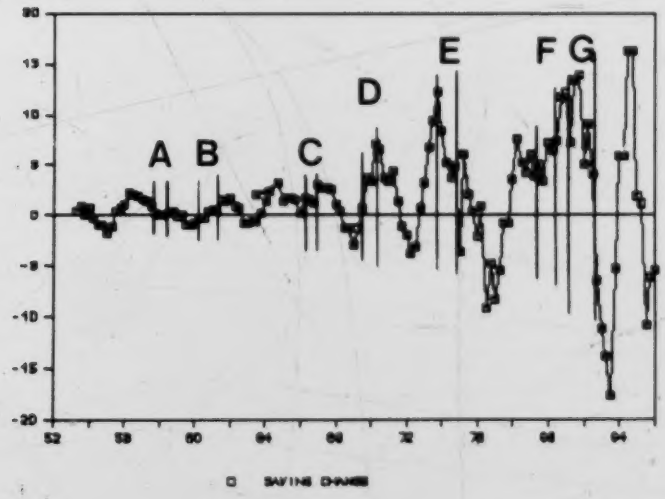


Figure 6.3.1 Income Change Less Expenditure Change compared to Gross National Revenue

balance, the trend of the difference. To compare Figure 6.3.1 with the trend changes in Figure 6.2.1, lines are drawn with a ruler and pencil to reflect the turning points in the economy.

The analysis of this graph requires following of other news and information which may affect the rate of savings. Has any policy been announced which validates a change in this measure? Examples are announced tax increases or decreases, which may affect long term savings. The plot does show, however, that this measure of savings rate change turns negative for more than two quarters several quarters before a peak in the economy. The explanation for this is that savings rates are reduced during an expansion, and at some point prior to the peak, the consumer decides to increase the savings rate, thus reducing consumption growth. This appears to happen before every slow down or recession. It may be that when the consumer has spent or reduced the accumulation rate of his savings, and wishes to rebuild his savings account prior to more purchases. However, one must be careful not to use this indicator alone. A good example is 1962. Note that the savings rate is sharply negative. At the same time the Kennedy Administration was drafting tax cuts aimed at stimulating the economy. This was well known at the time, and may have increased spending levels on the expectation of higher income in the future.

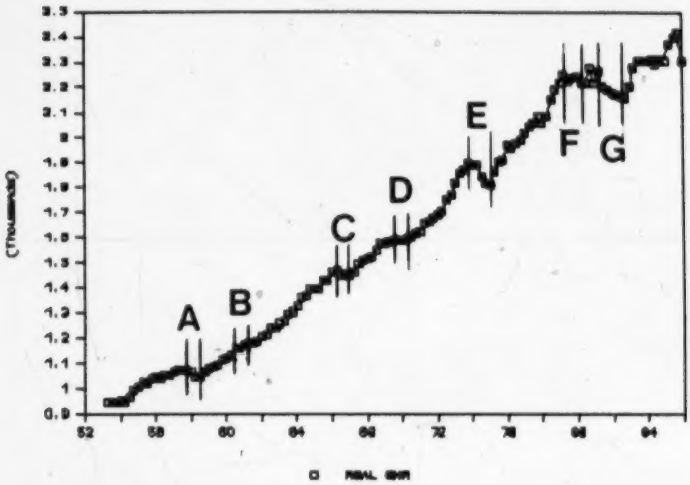
Several quarters (more than a year) prior to the 1974 and 1980 recessions there were extended periods of negative savings rates, and, as will be seen in the following section, were accompanied by peaking

consumer debt.

When using this indicator it should be determined if there has been two years since the last recession or slow down, and if there is any news related to the change. If an expansion in the economy has been under way for some time, and this indicator has been negative for more than two quarters, a trend change is indicated, unless the change in the indicator is explained by some news development. Examples of news which may affect savings are tax changes, monetary policy shifts, inflation or currency changes. Excepting the 1954 recession, when this indicator turns positive for one or more quarters, the economy is at or near a bottom. One consideration of that time period was the fact that personal debt was very low (section 6.4).

6.4 Personal Debt

Personal Debt is, as will be shown, probably the best indicator of future economic growth. This measure gives a good view of the consumer's willingness and ability to purchase in the near to medium term. A look at the graph will give an indication of consumer liquidity, and generate an impression of the time frame before a change may occur. The same consumer dollar can't buy goods and services and pay back debt at the same time. Conversely, relatively low debt levels indicate an increased ability to purchase as debt servicing costs are low. From the model, the borrowing rate has to stay the same or increase from period to period to maintain growth. At the very least, debt cannot decrease by more than personal income increases to have growth. Another major factor is that personal



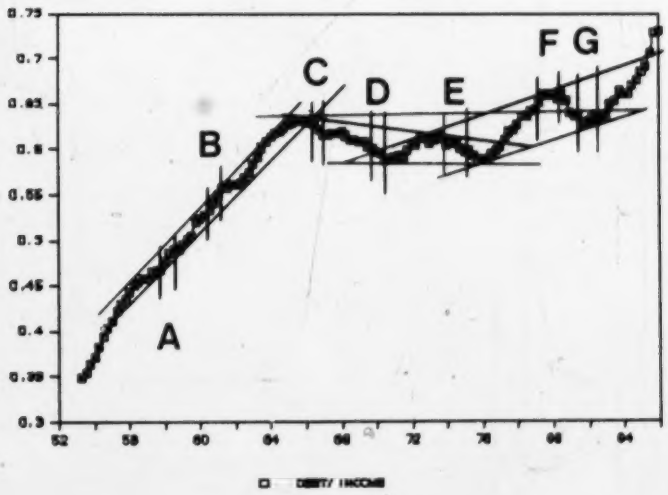


Figure 6.4.1 Ratio of Total Consumer Debt to Income Ratio Compared to Gross National Revenue

debt has limits. It is assumed here that the consumer will balk at borrowing when either debt or debt servicing costs reach some absolute level or ratio of income. Principle payments may be delayed, but interest payments generally have to be made. Both these factors are sensitive to changes in interest rates.

The ratio of total debt to personal income is plotted to give a view of longer term debt commitments. Figure 6.4.1 shows this graph. Again we draw lines to reflect turning points in the economy. Observe that when the rate of increase in debt slows (the slope of the debt ratio curve becomes less positive), the economy slows. Note as well, that when the rate of decrease slows (the slope becomes less negative), the economy can grow. This reflects the relationship between the second order change in debt and the change in economic activity. We see as well that the rate of borrowing slows before dropping and vice versa. The graphical representation is quite smooth at the resolution shown, making the trend changes appear gradual.

Note that the growth in personal debt peaks well before the economy at large. If we couple this with the evidence that GNR peaks at or often before conventional GNP measures, a good lead time is established. A visible decrease in slope appears three to eight quarters before a peak in the economy. It is advisable to be aware of external factors, however. The mid to late sixties saw a general decrease in the overall debt level. As was mentioned earlier, there was economic stimulus from the Kennedy tax cuts during this period. These types of events are why the slope change

is more important than whether the slope is positive or negative.

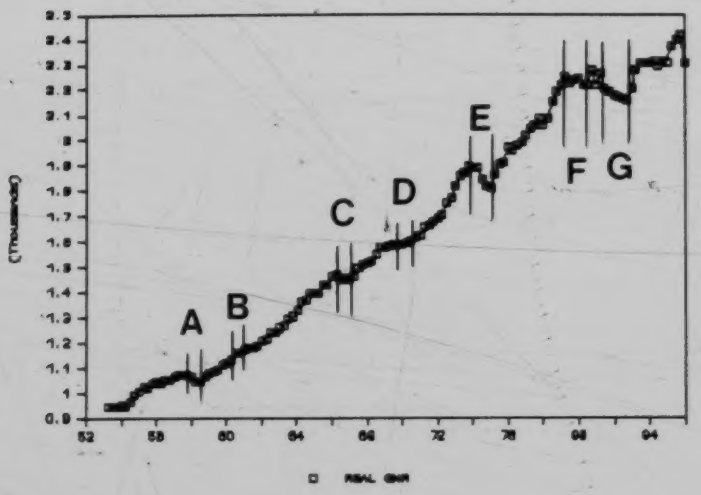
A more revealing portrait is drawn by Figure 6.4.2. The ratio of Consumer Instalment Credit to Personal Income is included because it is assumed to be the most sensitive and responsive indicator of the consumers purchasing power. Short term debt has the highest cost and the greatest volatility of personal debt instruments. To get a grasp of the cost of the debt, as well as the level and trend, graphs in the recommended source material should be consulted while analyzing the debt graphs. The volatility has increased since the dropping of the gold standard and the increased use of monetary policy instruments by the Federal Reserve Board. As with the previous plots, the trends are marked, but with this graph (Fig. 6.4.2) one more step is taken, peaks and bottoms are marked also.

Using methods which are commonly used in the brokerage business, draw in trend, support and resistance lines. At peaks or valleys, draw horizontal lines. Between peaks or valleys, draw lines connecting peaks or valleys. The significance of these lines is to establish trend ranges.

The following important observations should be made:

1.) Is the current level above(below) the previous peak(valley)? Compare the horizontal lines. This may indicate either an approaching peak, or a change in the consumers' willingness to acquire debt.

2.) Is the current level above(below) the trend line connecting the previous two peaks(valleys)? This is more likely to indicate both a change in long term trend, and an approaching short term trend change.



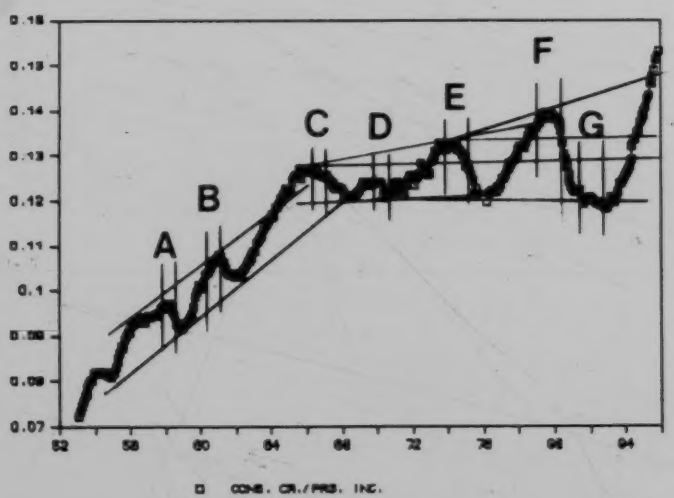


Figure 6.4.2 Ratio of Consumer Installment Debt to Income Ratio Compared to Gross National Revenue

3.) How long has the short trend been sustained? Look to see how long the direction has been in place since the last short term directional change. A breakout in either 1. or 2. coupled with a trend in 3. of a few quarters indicates a directional change is near.

4.) Is the rate of change (slope of the curve) increasing or decreasing?

5.) Changes in interest rates. The Business Conditions Digest and the Historic Chart Book contain short term interest rate graphs. Is the trend in interest rates the same or opposite to the trend in borrowing? When the interest rate is established in the same direction as the change in debt, a change in the direction of borrowing should be close. If they are going in opposite directions, there is more time until a change in economic direction.

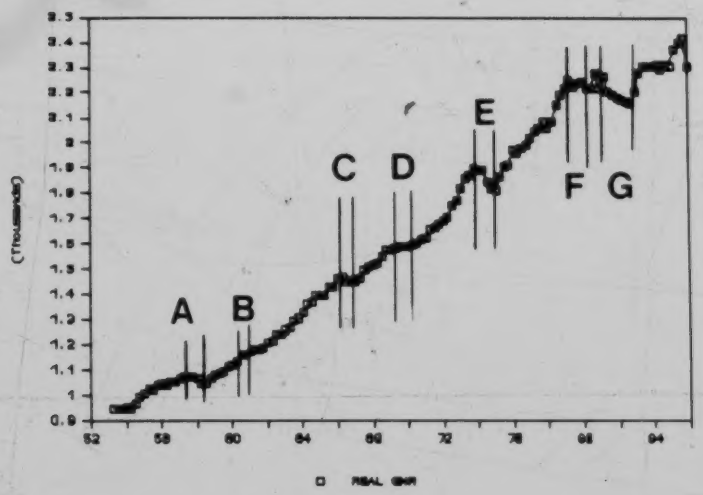
The explanation to item five is that if debt is increasing(decreasing), and so are interest rates, the consumer will soon reach a point where he/she will stop(start) borrowing.

Follow any news which may indicate sudden changes in monetary policy. These often give clues to where rates, and thus, borrowing are headed. It is wise as well to keep track of the reliability of reported policy and events and the subsequent responses. The oil supply crisis of the mid 1970's is an example. The Federal Reserve Board was determined to stop inflationary pressures caused in part by jumps in oil prices. This resulted in tight monetary policy, resulting in dramatically increased interest rates, which in turn put extra pressure on consumers.

The bottom line on consumer debt is whether or not the consumer is liquid. By observing recent borrowing trends, an opinion can be made as to whether the consumer is in a position to take on much debt. If the consumer debt ratio is near or below the previous low, the consumer may be considered relatively liquid. Conversely, if this measure is above the previous high, it can be assumed that the consumer may be running short of borrowing power. This determines the potential for growth or recession. The switch from the gold standard to unbacked paper money in 1971 seems, from the graphs, to have increased the volatility in the consumer credit. Consumer credit is a large portion of the economy, and has recently shown large percentage swings. The increased reliance on debt instruments throughout the economy is an indication that predicting changes in debt trends are important to the business person. The two measures of consumer debt can give advance warning on the order of one year of potential trend changes. This is the result of two factors. The slope change will point to a change in trend, or, the existence of a breakout from the previous pattern will indicate a correction or change of trend is approaching. Research in the form of monitoring of news and events is required to give insight into the nature and severity of the effects.

6.5 Inventories

Inventories management is an important focus of small business. Economy wide, inventories are also important. Large levels of inventories may result in layoffs, causing pressure on prices and employment. Low levels may lead to price rises and inflationary fears. Inventories may also indicate changes in economic conditions.



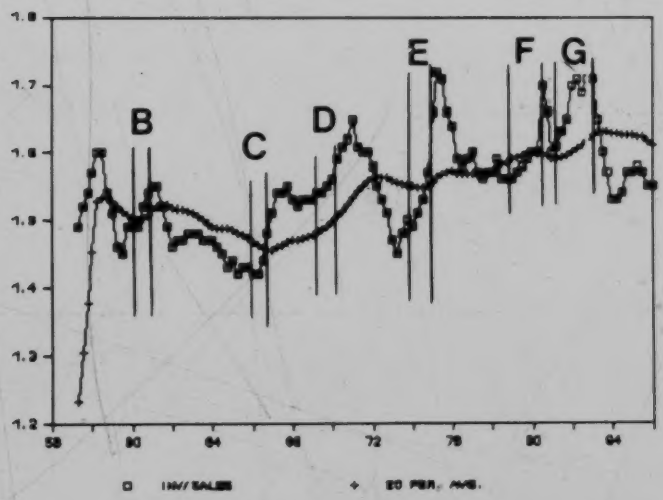
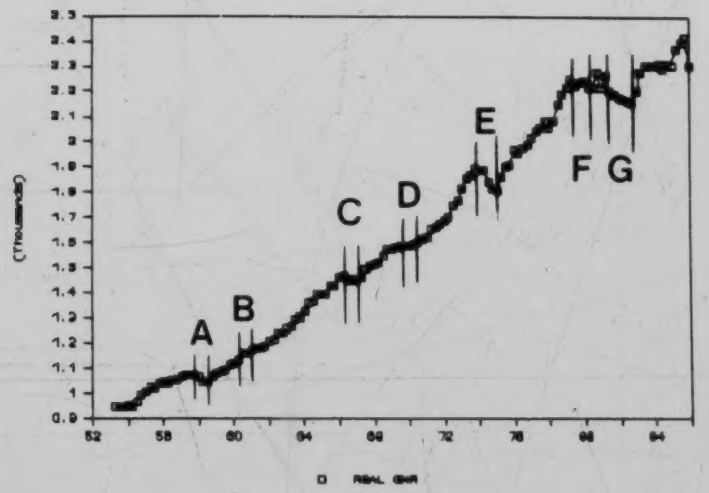


Figure 6.5.1 Inventory to Sales Ratio Compared to Gross National Revenue

When inventory levels drop below desired levels, the need for increased production is signalled. This leads to investment and expansion. A problem occurs if the consumer is "tapped out", or financially overextended. The production then stays on the shelves. How may this be indicated? A look at Figure 6.5.1 will give some clues. When the inventory to sales ratio bottoms and begins to turn up, the economy slows in 4 to 8 quarters. When the ratio peaks, a recovery is near. The use of a 20 period moving average smoothing of trend is useful to help estimate when levels are above or below desired levels, using the trend line as an estimator for desired levels.

When the ratio crosses the trend line, it must then be determined if the ratio can continue on that side of the line for any period of time. It must be asked if there is good cause to expect this condition to last. This entails a check of consumer debt and savings graphs. Check to see what condition is the consumer in. The news should be followed and noted for developments. Technological developments may affect output levels or inventories. Government policy changes may have inventory effects. Supply considerations, such as material shortages may also affect inventory levels.

The plots show that industry tends to over-react to both recoveries and recessions. Two observations come out of the graphical analysis of inventory to sales ratios: Too much is produced late in the recovery cycle, and too little is produced late in the recession cycle.



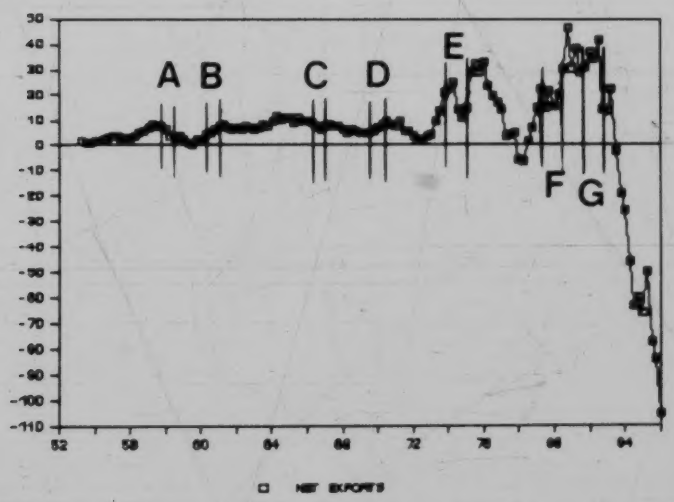


Figure 6.6.1 Net Exports Compared to Gross National Revenue

6.6 Net Exports

Figure 6.6.1 shows the trend in net exports for the U.S. For most of the period from 1953 to 1986, the range has been close to zero, with a slight positive bias. In more recent years, though, this has changed. Since dropping the gold standard and moving to floating currency, trade fluctuations have become more volatile. This has led to increased activity in trade legislation and policy moves to affect interest rates and currency. A long running, relatively large trade deficit is a recent consideration in the U.S. economy. Already we are seeing tremendous changes in currencies and in Congressional action. Economic theory indicates that the currency should go in the same direction as the trade balance[73].

6.7 Lead Time Summary

The Gross National Revenue measure tends to change direction one or more quarters ahead of Gross National Product (GNP). This reflects the inclusion of inventory increases and investment increases in the calculation of GNP.

The measure reflecting the change in savings rate, calculated by subtracting expenditure change from income change, (smoothed four quarters) moves from three to twelve quarters ahead of the economy. Significant negative readings (three or more quarters in the negative region) indicate peaks five to seven quarters away.

Trend breakouts in the debt ratios indicate change in approximately

six months to one year. Slope changes indicate about two quarters. These should be considered in unison with each other and interest rate trends to obtain the best results.

The inventory to sales ratio normally shows signs of bottoming three or more quarters before a peak in GNR.

6.8 Summary Of Graphical Methods

The proper application of the graphical analysis is to check each graph for indications of trend change. This is accomplished by comparing past and present trends. Differences in the graphs from period to period indicate possible changes in trends. The expected trend is based on the indications of a majority of the indicators, with support from outside news. The indication of each variable is considered, in conjunction with any other available relevant information, and added to the rest, resulting in a +, - or neutral reading. The severity of the change is indicated by the degree of disparity the variables display compared to previous changes. Are all the variables indicating change, or only most? Are the indications strong, or mild for each variable? Is there any other justification for the variables to behave this way? This warns the manager to adopt policies which reflect the expected events.

Factors to remember while analyzing the graphs:

1. Consumer borrowing peaks prior to recessions, and bottoms prior to recoveries.
2. A negative move in savings rate of 2 or more quarters indicates a

possible downturn, while a move to the positive region during a recession indicates a turnaround.

3. A bottoming in the inventory to sales ratio indicates a slow down, while a top indicates a recovery. A move across the long term average suggests checking the other indicators and news for evidence that a bottom or top is near.

4. Net Exports give an indication of possible changes in interest rate and trade policy.

5. The GNR graph (Fig. 6.2.1) gives a rough indication of when to expect change. This measure moves ahead of conventional GNP, as shown by the same graph. A look at the time between slow downs will give an indication of whether a change may be due.

6. Follow key news items. When it is reported, for example that the consumer can no longer lead the recovery, what are the implications? Other themes which may be in the news near trend changes are "things couldn't be better(worse)." Ironically, they may be right. If this story <u>is</u> correct, then a change is near.

Following this, check for any external clues such as news items which may influence one or more of the indicators. It is important to remember to keep track on a continuing basis of important events and their effects. It cannot be stressed enough that an indifferent attitude be applied. While observing the graphs questions such as "Can this go on?", or "Is this reasonable?" should constantly be on one's mind.

What is the savings trend, and how high can debt go before it

becomes a burden to the consumer? Previous levels and current short term trends will provide an estimate. Conversely, when is the consumer liquid? Debt is a very important factor in consumer behaviour.

What is the overall economic trend? Where are interest rates heading? Have we just seen a recession, or have we experienced a long period of growth? Historically, recessions or slow downs happen every few years[17], as do subsequent periods of growth. Periods of growth tend to be longer, and as the GNR graph (Fig. 6.2.1) shows, the long term trend is rising.

What are inventories doing? Steady movement one way or the other indicates an imbalance. Why are inventories changing? Is it a long term trend, or a signal of short term change?

Where are Net Exports going? Has there been any prolonged imbalance which may result in international payments problems or policy changes? What will be the effects on the currency?

Asking these types questions forces the analyst to form a consensus of the information. This is important to the small business manager, who often is a sole proprietor, with little in the way of informed input.

6.9 Specific Applications

The previous section discussed methods of forecasting aggregate economic activity. The rationale behind this is to determine the overall picture. Once the major direction of the overall economy is predicted, it remains to determine where a specific area or sector is headed. The principles which will be used here are those of income elasticity and life cycle. Markets respond to the income level in the economy either positively, negatively, or neutrally. Markets also respond to time change in the same fashion. This reflects changes in consumer preference and technology.

Both these factors are present in the rate of change of a sector or region with respect to the overall trend. To apply this, one must obtain data which reflects the particular sector and determine the relationship with the trend. Type of relationships include lagged, leading, linear, nonlinear, constant, positive and negative. The nature of the relationship may be observed by plotting both sets of data against time, and then comparing the two trends. This plot will indicate the relationship between the sector under consideration and the economy as a whole.

6.10 An Example: The Alberta Bust

The Alberta recession of the early 1980's provides an opportunity to illustrate a specific application of the graphical forecasting methods. Information in this illustration was that available prior to 1981, with some of the subjective material dating to 1978-79. The Alberta Treasury was the source of economic data for the province. Grain and livestock

trends were obtained from the Federal Reserve Bulletin and Richardson's Greenshields. Oil price and trade data were obtained from the above sources and the Federal Reserve Monthly Chart Book. Additional news items which were noted.

6.10.1 Relative Strength of the Alberta Economy.

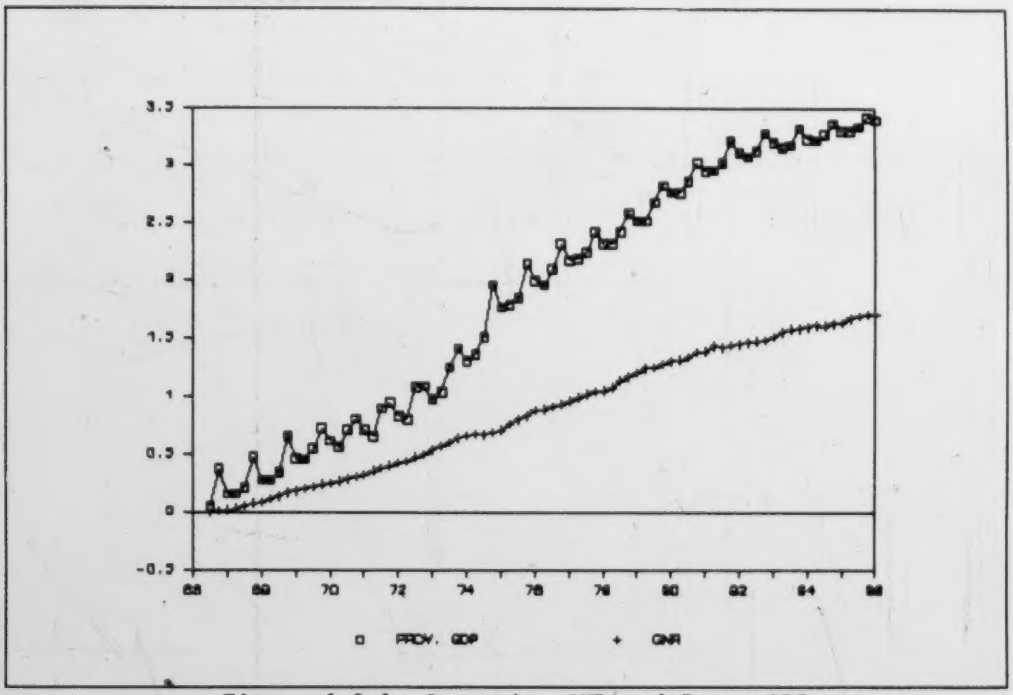


Figure 6.9.1 Comparing GNR and Prov. GDP

Comparing previous economic data of the rate of change of Provincial gross domestic product versus the rate of change of Gross National Revenue (GNR) showed an approximately constant relationship between Alberta's Gross Domestic Product (GDP) and GNR. The cumulative rates of change were

used. That is, the Alberta was growing at a constant ratio to its U.S. counterpart. A linear regression of the two indicated the constant relationship was reasonable.

The information in the news gives insight as to the possible future relationship between the local economy and the U.S. economy.

1. The unanticipated success of the Chinese agricultural reforms of the late 1970's, which resulted in dramatic increases in agricultural productivity for a major importer of our grain surpluses.
2. Warnings from Sheik Yamani of Saudi Arabia of the dangers of oil prices over $28 per barrel coupled with massive exploration ventures and development of unconventional oil resources, specifically North Sea oil reserves indicated a possible saturation of the market. Spot prices for oil were erratic, and meeting high resistance at the $35.00 a barrel range. There was also much evidence of cheating on production quotas by OPEC members.
3. The United States Department of Agriculture reported figures estimating the grain in storage in the U.S. at more than two thirds of a bumper crop.
4. Commodity prices in general had peaked and were beginning to decline.
5. Real Estate prices had ceased their sharp rise, exhibiting topping action at historic levels. Agricultural land was selling at prices which could not be amortized for any time period, given the interest rates and cash flows prevailing at the time.

The evidence put forth in the news of the 1978-1979 period indicated that perhaps the expectations of sky-rocketing oil prices and continued strong growth in Alberta were optimistic. The news indicated a levelling off of the oil industry and a decline in the agricultural sector. Continued success of the British North Sea oil development and cheating by OPEC members could even generate a downturn in oil prices. The failure of oil prices to continue upward supports this idea. A decline in these two areas would point to Alberta maybe holding its own but more likely under-performing the U.S. economy.

6.10.2 Graphical Indicators

Refer back to the previously discussed graphs (Fig. 6.2.1 to Fig. 6.7.1), and cover the post 1980 data. This will then show what was seen in the late 1979.

Graphical analysis showed the following:

1. The GNR began to decline in mid 1979, while GNP showed flat to modest growth (Fig. 6.2.1) after several years of rise, pointing to a possible slow down.
2. By late 1979, consumer instalment credit (Fig. 6.4.2) had been rising for 3 years, hitting an all time high as a percentage of personal income, breaking out of the previous pattern. A minor GNR downturn in '79 barely slowed the borrowing, but the borrowing was slowing.
3. The total debt to income curve (Fig. 6.4.1) was also in a break out position, pointing to a possible correction.
4. The difference between income change and expenditure change (Fig.

6.3.1) turned negative in mid 77, registering six quarters in the negative region, a bearish event.

5. The inventory to sales ratio (Fig. 6.5.1) had bottomed prior to the slow down in 79, and was just beginning to rise, indicating a slow down in sales or over production.

All of the graphical indicators sat in moderately to strongly negative position. These negative readings in all but GNR were indicated for more than two quarters prior to the end of 1979, indicating the peak was closer.

6.10.3 Observations in the News

The following are news items of the day:

1. Constantly in the news was the desire of the Federal Reserve Board of the United States, more specifically Paul Volker, the board's chairman, to bring inflation under control.

2. Interest rates were sharply rising, verifying the Federal Reserve Board's stated policy to stop inflation, and putting increased pressure on the overextended consumer.

3. GNP was reported to be growing at a modest rate. This was given as evidence that the fight against inflation caused by an over heated economy was being won. This spells trouble for any highly leveraged individuals or firms, as any price decreases may lead to difficulties.

4. Banks are failing at a rate not seen since the Great Depression. Defaults and bankruptcies are forcing banks out of business. Savings and loan institutions are the hardest hit.

5. Budget deficits were seen to be out of control.

6. Talk of $80 oil which would run out in ten or fifteen years was rampant.

The major news indicators pointed to a slow down in the economy.

6.10.4 The Projection

The graphical indicators and the supporting news indicators indicated a recession. The expected lead time of two to six quarters pointed to a mid 80 to mid 81 down turn. It remained to estimate the severity of the downturn which was expected.

The high levels of debt and interest rates, when compared to the 73 recession, indicated that it could be the same degree of severity as 73 if not more severe. The rise in both long and short term consumer debt from the previous recession low took both levels to historic highs. The graphs both demonstrate flattening exponential shapes, indicating a resistance to higher debt levels. This, coupled with interest rates near historic levels made debt servicing levels very high. The consumer was not liquid, by historical measure, and any move to build liquidity may become severe, as indicated by the disturbing new trend of declining troughs which point to more debt liquidation on the move.

The bottoming of the inventory to sales ratio at fairly high levels (by historical standards) may mean high levels of unemployment. A slow down in the economy with high inventory levels coupled with high initial

output levels contributing to those inventories may lead to a protracted down turn.

The developing grain glut coupled with uncertainties in oil price movements give rise to the possibility of a more severe reaction in Alberta. Charts of the period indicate a peaky and erratic oil price. The grain situation is poor, with huge surpluses in the U.S., equivalent to 2/3 of a bumper crop. The interest rate outlook indicated the possibility of actual deflation, which would create problems with liquidity. The outlook appears very negative for the local economy.

Subsequent events verified this projection.

6.11 Model Effectiveness

Applying the above procedure to the period from the mid fifties to 1986 results in the prediction of all the slow downs in the period. The application of external information helped to indicate the severity of the slow downs. A slow down was indicated by the graphs for the 1966 time frame, but additional information pointed to slow growth rather than an actual downturn. The anticipated tax cuts were in full force, enhancing consumer liquidity, and the Vietnam war effort was escalating, artificially inflating the economy, and keeping inventories and unemployment low.

Authoritive comment on current macroeconomic forecasts comes from the American Statistical Association. In August of 1988, this

organization, as reported in the Edmonton Journal, concluded that economic forecasts currently available predicted changes as well as flipping a coin. This is a disheartening revelation to the business manager, who often relies on widely published information for trend projections. As a footnote to illustrate the point, September 14, 1981, the President's council of economic advisors announced that there could not be a recession in the following year.

This brings up a point about published forecasts, especially government ones. Virtually no government official will predict a downturn in the economy. There are two reasons: It makes it tough to get votes and, there is the possibility that such announcements may cause a downturn. Statements from officials, such as the Federal Reserve Chairman tend to be stronger, and use terms such as "if we don't ... then maybe ...". Most other organizations know as well that "doom and gloom" forecasts are not popular. The usual procedure in these cases is to kill the messenger.

Some sources[52] indicate yearly and quarterly forecasts with standard error accuracy of up to 1% of GNP. Checking a graph[6] on Real GNP gives some indication as to why this is possible. Estimating the trend using a ruler, over the long run, can give a good guess. The problem is in determining changes in trend. This is where the errors are largest.

A Harvard Business Review article[11] suggests that forecasts are better than nothing, and that a consensus approach be used to make a prediction based on several forecasts, and their expected reliability. The

graphical method suggested here recommends using outside information, though not specifically forecasts, to assist in the process of determining validity.

To sum up, the graphical method will give a prediction of downturns which is superior to those generally available to the business person. The model will also lend verification to forecasts of growth which are reported.

7 RECOMMENDATIONS AND CONCLUSIONS

7.1 Method Selection

The previous two chapters discussed methods of forecasting aggregate economic activity, and applying the forecast to a particular industry or region. The rationale behind this approach is to first determine the overall picture, then to estimate how a particular industry or region fits into this picture. It was also determined that more conventional approaches to obtaining or developing a prediction of the future were less than satisfactory for the business application by managers.

The statistical methods, regression and time series analysis yielded results which were inferior to graphical interpretation methods. While the time series analysis did provide some evidence for the assumption of an adaptive gain model of economic adjustment, forecasts of trend and trend change were poor. If the economy is an adaptive gain, positive feedback system, this is to be expected, as serial correlations will not disappear. Regression analysis was limited to methods which could be reasonably explained to the uninitiated business person. This entailed using fairly simple relationships of the variables, and differencing of these variables. Here, Lotus gave basically the same results as the more sophisticated statistical software packages. However, errors were largest at turning points.

Graphical interpretation using the methods recommended gave the best predictions of turning points, and could be conducted without computer

assistance, if required. These methods require the visualizing of conditions using plotted data, and developing an understanding of and sensitivity towards factors which influence the economy. This provides a long term benefit to the business person who is looking for a workable model which will enable both a better understanding of economic variables, and generate reliable forecasts. An indirect benefit may accrue by the use of the model to provide a forecasting service to the smaller business person who may not have the inclination to develop his or her own forecasts. The application of this model is not restricted to any group, though it is adaptable to any business environment, as the goal is to provide a "user friendly", effective forecasting procedure.

The method proposed proves superior to the more conventional current methods used for business applications[11]. Current methods entail, primarily, the use of third party information, with little verification of the effectiveness of the forecasts, or the gathering and analysis of data and information without a set model or procedure. As outlined in the Harvard Business Review[36], the different methods require anywhere from a few hours a week up, and varying levels of expertise.

Statistical methods, while still requiring the gathering of data, tend to develop a reliance on the calculations. If the economy operates on an adaptive basis, the effects of the variables could slowly change without the statistical model indicating the change. This would increase forecast error over time. Current third party and in-house forecasts fall short in the accuracy department. In short from both an accuracy an

usability standpoint, the graphical method is superior, and thus is recommended for business use, as a management tool. Potential may also exist for special applications, such as forecasting services.

7.2 Application

Two steps are involved in the application of the recommended graphical method of forecasting. A procedure for gathering reliable data and producing the plots needs to be established. This includes the determinination of data types and necessary calculations to produce the proper raw and calculated data to plot. The second step is in developing a feel for reading trends in both the data and the news.

A consistent data base is important. To achieve this goal, three publications from two sources are recommended. These are the Business Conditions Digest, from the U.S. Commerce Department, and the Historical Chart Book and Federal Reserve Bulletin, from the Board of Governors of the Federal Reserve Board. All the data required is in these three publications in both tabular and graphical form. Only the calculated values for savings change are not included. Information is available on a subscription basis. Industry or regional information should be obtained from these or other governmental sources. These are the prime sources for other, secondary sources.

Due to the delay of up to one quarter in some of the data, more immediate information is required in the short term. The two recommendations here are Barron's, (preferred) a weekly paper, and The

Wall Street Journal, a daily. The format of Barron's is more user friendly. Just open the back two or three pages, and all the information is there. Most of the supplementary information for the judgemental process is also included. Being a weekly publication, only the more important material is covered. Care must be taken to verify the form of the data, and to update with the government data as it becomes available.

7.2.1 Data Required

All the data items are required quarterly, except personal income, which is required in both monthly and quarterly form, and consumer instalment credit, which is required monthly.

1.) Total Debt or Total Debt to Personal Income Ratio. The convenient method is to estimate this off a chart of the Total to Personal Income Ratio (Historical Chart Book).

2.) Consumer Instalment Credit. This figure is reported in most financial sections of newspapers. The ratio can also be estimated from charts (Historical Chart Book).

3.) Personal Income. If the debt ratios are not entered in the data, this item is needed to calculate them (Business Conditions Digest).

4.) Disposable Income. This is needed in the calculation of the income change less expenditure change (Business Conditions Digest).

5.) Mortgage Debt. This is can be estimated from the household debt chart (used in 1.). One third of this value is used as a proxy for down payment on homes.

6.) Personal Consumption. This is used in calculating income change less

expenditure change (Business Conditions Digest).

7.) Implicit (GNE) Price Deflator. This is optional, as all the graphical values depend on ratios, or in the savings change measure, a positive or negative value. This deflator does, however, reduce the variability between time periods, reducing the spread from one end of the graph to the other (Business Conditions Digest).

8.) Inventory to Sales Ratio, plus a 20 quarter moving average (calculated) (Business Conditions Digest).

9.) Net Exports. The nominal quantity is usually reported, as is the case with all the non-ratio variables (Business Conditions Digest).

10.) The calculated value for savings change and a four quarter moving average are needed.

When updating data, it is important to maintain consistency. Changes in the variables may be reported in percent or nominal quantity, while levels may or may not be reported. Net Exports and Inventory to Sales Ratio are reported as is. Choose one reporting style and adjust by any necessary calculation to convert to the desired form for the analysis. Appended are two Lotus files (monthly and quarterly) with the appropriate entries and calculations.

Reading the trends requires that the resolution is not too high. Some blurring of data smooths out the "noise" while still revealing the underlying [illegible] explanatory graphs in chapter six give the type of resolution required. The charts in the recommended sources also display the type of resolution which makes analysis easier.

Interpretation requires practice. Plots, trends and events are compared to fine tune forecasting skills. The method is judgemental in nature. Reason is employed in observing and understanding the graphs. A series of self-generated questions such as those suggested should be asked. A list should be made up, and updated with relevant questions to seek answers to while conducting the analysis.

7.2.2 Time and Investment Factors

A major consideration in the implementation of any program is the expected cost of introducing the program to the operation. This is composed of two factors in this case, time and money.

The cost of introducing the recommended forecasting model is minimal. Yearly subscription cost the desired publications cost is Barron's, $92 (U.S.), the Business Conditions Digest, $44 (U.S.), and the Federal Reserve Bulletin, $65 (U.S.). The Historical Chart Book is $1.25 per copy, published quarterly, and the Federal Reserve Bank of Dallas offers The Economic Review free. It is assumed that the local news is tracked as a matter of course.

The time requirements are low as well. Collecting, storing and plotting the data require less than one hour per month. This is independent of manual or computer use. The reading of Barron's and the local newspaper require the most time. Watching the news on television once a day adds another few hours per week. Relevant information should

be noted and kept on file. This process will take two or three hours per week. The interpretation of the graphs and comparison with the noted material will take another hour or two per month.

The time and monetary commitments are not prohibitive for any business person (including the owner/operator) who desires to improve operating and capital decisions by utilizing an effective forecasting tool. Someone wishing to use this model to provide a forecasting service would have ample time to produce forecasts and supplement them with additional insight and information, while maintaining a monthly or bi-weekly format. This provides a potential secondary method of generating forecasts for the firm who may not wish to do in house forecasting.

7.3 Advantages

The projected graphical prediction method provides the means for the business manager, or an agent wishing to generate forecasts for smaller and other firms, to model the economy and forecast trend changes. What was once largely externally supplied from questionable sources may be internally generated and tailored, over time, to the individuals firm's needs. Events associated with the last recession demonstrated the need for better forecasting methods, especially for privately held firms. While the failures of large firms made the news, the majority of the business failures were smaller, privately held businesses.

The independent business is usually a price taker in the economy[58], and therefore is at a disadvantage if conditions are not correctly

anticipated.The firm's management decision making process requires reasonably accurate forecasts. Being in gear with the economy will remove a major source of risk to the success of business enterprises.

With the accurate trend predictions, the following may be accomplished ahead of time, reducing risk:

1. Inventories may be built up or trimmed.
2. Production plans revised.
3. Personnel requirements re-evaluated.
4. Marketing and pricing strategies adjusted.
5. Procurement methods re-evaluated.
6. Short term financial situation - payables, receivables, working capital policies reviewed.
7. Long term capital investment/divestment decisions reviewed.

The correct course of action is the easiest to accomplish, but often the hardest to detect. At economic peaks, it is easy to sell, as there are lots of buyers, and at bottoms the reverse is true. This probably reflects the advantage provided by the models' accurate trend predictions. Being able to give a high probability projection of when the trend may change enables the manager to better capitalize on the moves. The major failing in this method is that there is not certainty in the time frame provided. This problem is common to other types of forecasts. The answer to the uncertainty problem: it's better to get off the track an hour before the train gets there than one second too late.

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APPENDIX A

Recommended Sources of Data

Business Conditions Digest

Superintendent of Documents

U. S. Government Printing Office

Washington, D. C., 20402

Federal Reserve Bulletin and Historical Chart Book

Board Of Governors of the Federal Reserve System

Publications Services

Mail Stop 138

Washington D. C., 20551.

Economic Review

Federal Reserve Bank of Dallas

Public Affairs Department

Station K,

Dallas Tx., 75222.

APPENDIX B

Lotus 1-2-3 Format Used

Two Lotus formats were used in tabulating the data required for the graphical analysis. These were for handling quarterly and monthly data. The first three rows were reserved for headings to describe the data. Where annual rates are shown, the entry represents four times the actual quarterly figure. The first row of each column is shown.

1. Quarterly Data Format

Column	Description
A4	Year and Quarter in decimal form.
B4	GNE Deflator.
C4	Personal Income, annual rate.
D4	Disposable Income, annual rate.
E4	Personal Consumption, annual rate.
F4	Consumer Instalment Credit Outstanding.
G4	Home Mortgage Debt as a percentage of Personal Income.
H4	"Other" Debt as a percentage of Personal Income.
I4	Net Exports, annual rate.
J4	Inventory to Sales Ratio.
K5	Change in Income less Change in Expenditure. (C5*(1-G5/300)-E5)*100/B5-(C4*(1-G4/300)-E4)*100/B4
L9	Four Period Moving Average of K5. @AVG(K5..K9)
M5	Gross National Revenue. (E5+(4*C5*G5/300)+I5)*100/B5

N4	The Ratio of Consumer Instalment Credit to Personal Income. (F4/C4)
O4	The Ratio of Total Debt to Personal Income. N4+G4+H4
P23	Twenty Period Moving Average of Inventory/Sales. @AVG(J4..J23)

2. Monthly Format

Column	Description
A4	Year And Month in decimal form.
B4	Personal Income, annual rate.
C4	Consumer Instalment Credit Outstanding.
D4	Ratio of Consumer Instalment Credit to Personal Income. (B4/C4)